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THE STATE FORESTER OF MASSACHUSETTS.

NINTH ANNUAL REPORT, 1912.

F. W. RANE, State Forester.

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Approved by
The State Board of Publication.

The Commonwealth of Massachusetts.

To the General Court.

It again becomes my pleasure as well as duty to submit this the ninth annual report of the State Forester, which reviews the work of this department during the year, with recommendations for its future needs.

As the gypsy and brown-tail moth work, which has been under the State Forester now for four years, has so amalgamated into our regular work that it is a division, just as forestry management, forest fire work, etc., instead of dividing the annual report into Parts I. and II., as heretofore, the moth work this year is treated simply under a division heading.

This report is submitted in accordance with the provisions of chapter 409, section 5, Acts of 1904.

Respectfully submitted,

F. W. RANE,
State Forester.

Dec. 14, 1912.

CONTENTS

A plantation of our native white pine at fifty-five years of age growing at Frankfort, Germany. We should have a large acreage like this in Massachusetts in the future. (Dr. M. Nausauer on the left, Oberforester Fleck on the right.) Taken by Massachusetts State Forester last summer.

The Commonwealth of Massachusetts.

NINTH ANNUAL REPORT OF THE STATE FORESTER.

Introduction.

The year of 1912 closes an extremely active season in the State Forester's department. Forestry work generally has met with enthusiastic support at the hands of our people, and it is a pleasure to serve in a public capacity under such favorable auspices.

We have a natural forest country and should take advantage of such a heritage. The renowned Black Forests of Germany show what can be accomplished by systematic methods, while in this country the State of New York has been farsighted enough to establish a forest preserve, the area of which approximates two-thirds the size of our whole State. I believe it is time that we people of Massachusetts should take steps to secure a forest preserve which might include, for example, the whole beautiful Berkshire country west of the Connecticut River, or our own renowned Cape Cod District. Either of these areas could readily be made into State reserves, and exploited under modern ideas of forestry management similar to the methods now proposed in the Adirondacks. At the present writing, individuals may destroy at their will the forest products, which will take time and great expense to replace. On the other hand, individual effort can accomplish a great deal, as a trip to Lenox and Stockbridge will testify, but of course quicker and greater results would come from State management of such lands. With a progressive policy a Berkshire forest reserve would ultimately outrival anything in Europe, as its location and topography are ideal.

Although good old Cape Cod is a different forestry proposition altogether, nevertheless its thousands of acres of depleted and waste lands were once covered with magnificent forest growth,

and I believe they could be returned through State management, at small expense, to a sylvan condition which would not only be a delight to the people of Massachusetts but prove attractive to many from other States who summer with us. The light soils of the greater part of the Cape far surpass the sandy lands about Darmstadt, Germany, where there are flourishing forests. Our State highways are already proving that such an expenditure of State money pays, and it is believed that State supervision in forestry would prove equally beneficial. Forestry differs even from building State highways, in that forests neither wear out nor necessitate a constant maintenance expense, but, on the contrary, bring interest upon the investment and eventually enhance the principal itself.

On such a question, I believe I know where the various Massachusetts organizations, such as the State Board of Agriculture, the Massachusetts Forestry Association, the State Grange, Federation of Woman's Clubs, Fish and Game Associations, etc., would stand. We could rely upon their whole-hearted assistance.

When visiting the national forest near Brussels and while tramping through the Black Forests of Germany the past summer, I was charmed with their achievement, which appealed to me from both the economic and æsthetic standpoint. It was imperative that, on my return, I should try to enthuse the people of the old Bay State to greater endeavor by showing them what might be accomplished by solving the problem in a practical way.

Our people generally have grown to appreciate the great good that has been accomplished through establishing a State-wide forest fire protective system. With many lookout stations scattered over the whole State, from which vigilant, trained observers detect and report fires in their incipiency; with four district forest wardens who patrol their divisions and instruct and confer with the local forest wardens in their territory; with a corps of 300 rural mail carriers who travel 6,000 miles daily, except Sundays, with instruction to report all forest fires; and with improved equipment and better systematized organizations for fighting forest fires and determining their causes, we are launching out upon a new era of future possibilities in forestry in this State. Forest fires must absolutely be eliminated if we are to build a stanch, State-wide forest policy.

What is true of forest fires is equally true, only in another way, as to overcoming our forest insect and disease outbreaks. We have been fighting the gypsy and brown-tail moths for years at great expense, — unwelcome guests, to say the least; but with improved methods and organized effort we were able to reduce the annual appropriation $65,000 the past season, and will recommend an additional reduction of $50,000 this year, making the amount asked for this year only $200,000, as compared with $315,000 ordinarily expended.

The chestnut bark disease is prevalent in the State, and the State Forester is lending every assistance possible in acquainting owners of chestnut growth with the latest methods of combating it. The national government is assisting us in our work against the chestnut bark disease. In a new country like ours it necessarily takes time to adopt and systematize our work so that it will result in future benefit to our people. Forestry and its future importance to the State is as yet relatively little appreciated, as it takes time to educate people generally to recognize its real value.

It is a pleasure to state that the last year's General Court gave the State Forester's department very generous consideration, and we have been enabled thereby to accomplish the work set forth in the following pages of this report.

The constitutional amendment relative to the taxation of forest lands has become a law, after having been submitted to the vote of the people at the recent election. The vote of the last General Court was practically unanimous, as there was not a dissenting vote in the Senate and scarcely any in the House, thus showing the popularity of the measure. It now remains for the incoming General Court to enact some practical, simple and effective legislation which will be sure to encourage modern forestry throughout the State. The State Forester does not wish it to be understood that he advocates the exemption of forest and waste lands from taxation. He believes that these lands should receive definitely regulated taxation, so that their owners may profitably allow the forest product to stand until mature.

The assistance by the State to towns having a million and a half or less valuation, for the purpose of having some permanent forest fire-fighting equipment, has been readily taken advantage

of this year. The $5,000 allotted each year was exhausted early in the season, and we have requests already booked for next year.

Surveys and maps have finally been completed of all lands taken over by the State under the reforestation act. These are on file for future use.

The department has more nursery stock on hand than ever before, and a progressive policy has already been started with a view to reforesting all waste or worthless lands belonging to our State institutions. The policy is to furnish the stock for planting, free of charge, provided the institutions meet the expense of labor in setting them out.

The United States government, as was predicted last year, has agreed to take definite control of the problem of the spreading of the gypsy moth; hence hereafter our State work resolves itself down to internal self-preservation in the territory already infested. It behooves us, therefore, from now on to perfect and improve the conditions in our towns and cities. In order to accomplish this it must be self-evident that the man locally in charge must have sufficient training and ability to comprehend modern methods first, and in the second place have the ability to handle labor economically.

The assistance given citizens and institutions in suggesting and demonstrating methods of forest management has been greater than ever. The experiment of substituting runabout automobiles for motor cycles for division men who necessarily are constantly traveling has proved in some instances a great advantage.

There are other phases of the work that might be mentioned here, but they are to be more fully explained under their proper classification in this report.

Organization.

As is inevitably the case, there have been a few changes during the year in the personnel of the general staff of assistants, but we are fortunate in having intact the greater part of the same trusted and tried organization.

Mr. L. H. Worthley, who has been connected with this department as assistant in moth work for a number of years, resigned

the fore part of the year to accept a similar position with the entomological division of the United States Department of Agriculture. The promotion was a well-deserved one, and after spending eight months in Europe with Mr. Fiske, the government expert, studying the moths in their native haunts, he is now delegated to the duty of checking their spread from New England to other sections of the country. While the State of Massachusetts in a sense loses his services directly as a State employee, we feel assured that in his new position his services may prove of even greater value to us. Mr. George A. Smith, superintendent of District 1, was promoted to the position of assistant in charge of moth work. Mr. Smith has been connected with the work for a long time, and we are fortunate in having one so well qualified to fill this place.

Mr. R. M. Colley of Harvard University, who had charge of the work of propagating and disseminating the fungous disease of the brown-tail moth, completed his work this fall, and Mr. John Murdoch, Jr., a graduate of the Harvard Forestry School, who has been in the employ of this department during the past year, has been placed in charge.

Mr. F. F. Moon, who was associated with the State Forester as assistant during his connection with the Massachusetts Agricultural College, as professor of forestry, resigned to accept a professorship at Syracuse University. Mr. Clark, formerly of the State College of Pennsylvania, has been elected to succeed Professor Moon.

Mr. Wm. Reiff, a student of the Bussey Institute, who was temporarily engaged to carry on some experimental work on a large scale with the flascherie disease of the gypsy moth, under the general direction of Prof. W. M. Wheeler, resigned on August 1.

The organization of the State Forester's department at present is as follows: —

General Staff.

F. W. Rane, B.Agr., M.S.,	State Forester.
H. O. Cook, M.F.,	Assistant Forester.
M. C. Hutchins,	State Fire Warden.
George A. Smith,	Assistant, moth work.
R. S. Langdell,	Assistant, reforestation.
H. F. Gould, M.F.,	Assistant, forestry management.
W. D. Clark, M.F.,	Assistant, Massachusetts Agricultural College.
R. H. Colley,	Assistant, moth disease work.
John Murdoch, Jr., M.F.,	Assistant, moth disease work.

Charles O. Bailey,	Secretary.
Elizabeth Hubbard,	Clerk, bookkeeper.
Charlotte Jacobs,	Clerk, mail and office.
Emilie Rau,	Stenographer.
Josepha L. Gallagher,	Clerk.
John Lanergan,	Office boy.

Co-operative Scientific Staff.

L. O. Howard, Ph.D.,	Chief, United States Bureau of Entomology, Washington, D. C., parasites and predaceous insects.
Theobald Smith, Ph.B., M.D.,	Professor of Comparative Pathology, Harvard University, diseases of insects.
Roland Thaxter, Ph.D.,	Professor of Cryptogamic Botany, Harvard University, fungous diseases affecting insects.
W. M. Wheeler, Ph.D.,	Professor of Entomology, Harvard University, experimental entomologist.

Staff, Forest Fire Protection.

F. W. Rane, M.S.,	State Forester.
M. C. Hutchins,	State Fire Warden.
M. E. Fenn,	Assistant.
James Moloy,	District Forest Warden No. 1.
J. J. Shepherd,	District Forest Warden No. 2.
John P. Crowe,	District Forest Warden No. 3.
F. L. Haynes,	District Forest Warden No. 4.

Observers and Observation Stations.

District 1: —

Wm. Bray,	Bald Pate Hill, Georgetown.
Henry Fay,	Hart Hill, Wakefield.
J. Frank Hammond,	Robbins Hill, Chelmsford.
Elliot C. Harrington,	Blue Hill, Milton.
Alfred MacDonald,	Bluff Head, Sharon.

District 2: —

Calvin Benson,	Shoot Flying Hill, Barnstable.
Frank L. Buckingham,	Reservoir Hill, Plymouth.
Irving W. Chace,	Richmond Hill, Dighton.

District 3: —

J. Harry Allen,	Wachusett Mountain, Princeton.
Alfred W. Doubleday,	Lighthouse Hill, Prescott.
W. J. Halloran,	Fay Mountain, Westborough.
F. H. Lombard,	Grace Mountain, Warwick.
Geo. W. Sherman,	Steerage Rock Mountain, Brimfield.

District 4: —

Albert E. Bauer,	Greylock Mountain, Adams.
Edwin F. Desmond,	Becket Mountain, Becket.
Geo. C. Miller,	Mount Tom, Easthampton.
Nelson C. Woodward,	Massamet Mountain, Shelburne.

STAFF, MOTH WORK.

F. W. RANE, M.S., . . . State Forester.
GEORGE A. SMITH, . . . Assistant (General Superintendent).
ENWRIGHT, JOHN W., Superintendent, District 1, 299 Fellsway, Medford.
PHILLIPS, SAUL, Superintendent, District 2, P. O. Box 266, Beverly.
WORTHEN, FRANCIS C., Superintendent, District 3, Central Street, Georgetown.
FITZGERALD, JOHN J., Superintendent, District 4, 50 Howard Street, Haverhill.
HATCH, WILLIAM A., Superintendent, District 5, 174 Main Street, Hudson.
RAMSEY, HARRY B., Superintendent, District 6, 27 Lincoln Avenue, Worcester.
PARKHURST, CLARENCE W., Superintendent, District 7, P. O. Box 472, Medfield.
HOLMES, WALTER F., Superintendent, District 8, King Street, Cohasset.
FARLEY, JOHN A., Superintendent, District 9, Plymouth, R. F. D.
CARLETON, JOHN F., Superintendent, District 10, East Sandwich.

Inspectors.

ARMSTRONG, HENRY F. MERRICK, JOHN L.
EMERSON, THOMAS. SANDS, GEORGE A.
SILVA, JOSEPH.

Mechanics.

HALPIN, FREDERICK P. TOWLE, CLAUDE E.

LEAROYD, FRANCIS V., in charge, Supply Store.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS.

[Alpabetically by towns and cities.]

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
No telephone, .	B. E. Wilkes,[1] . . .	**Abington,** . .	C. F. Shaw, . .	9
No telephone, .	W. H. Kingsley, . .	**Acton,** . . .	J. O'Neil, . .	5
2003-M, . . .	Henry F. Taber, . .	**Acushnet,** . .	A. P. R. Gilmore,	10
48-2, ...	John Clancy, . . .	**Adams,** . .	John Clancy, .	6
3165-11, . .	E. M. Hitchcock, . .	**Agawam,** . .	– –	–
151-32, Great Barrington.	J. H. Wilcox, State Line,	**Alford,** . .	– –	–
– –	James E. Feltham, . .	**Amesbury,** . .	A. L. Stover, .	3
174-3, . . .	A. F. Bardwell, . .	**Amherst,** . .	W. H. Smith, .	6
71-3, ...	John H. Playdon, . .	**Andover,** . .	J. H. Playdon, .	4
35, ...	Walter H. Pierce,[1] . .	**Arlington,** . .	W. H. Bradley, .	1
2-12, ...	John T. Withington, .	**Ashburnham,** .	Chas. H. Pratt, .	5
– –	Wm. S. Green, . .	**Ashby,** . .	H. A. Lawrence, .	5
4-12, ...	Chas. A. Hall, . . .	**Ashfield,** . .	– –	–
146-L, So. Framingham.	Horace H. Piper, . .	**Ashland,** . .	M. Geoghan, .	7
48-J or 72-4, .	Frank P. Hall,[1] . .	**Athol,** . . .	W. S. Penniman, .	6

[1] Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
34-4,	Hiram R. Packard,[1]	Attleborough,	W. E. S. Smith,	7
5-17,	J. F. Searle,	Auburn,	J. F. Searle,	6
8072-4,	J. W. McCarty,	Avon,	W. W. Beals,	7
96-4 or 477-4,	Chas. E. Perrin,	Ayer,	D. W. Mason,	5
236-2,	Henry C. Bacon, P. O. Hyannis.	Barnstable,	H. C. Bodfish,	10
8-4,	A. E. Traver,	Barre,	G. R. Simonds,	6
3-12,	Elmer D. Ballou,	Becket,	- -	-
No telephone,	Chas. E. Williams,	Bedford,	W. A. Cutler,	1
10,	James A. Peeso,	Belchertown,	E. C. Howard,	6
8157-22, Milford,	L. Francis Thayer,	Bellingham,	H. A. Whitney,	7
409-W,	John F. Leonard,[1]	Belmont,	C. H. Houlahan,	1
No telephone,	Gideon H. Babbitt, Taunton, R. F. D., 1.	Berkley,	J. M. Alexander,	9
14-6,	Walter Cole,	Berlin,	E. C. Ross,	5
2-13,	Edson W. Hale,	Bernardston,	- -	-
168-12,	Robt. H. Grant,[1]	Beverly,	J. B. Brown,	2
22-2,	E. N. Bartlett,[1]	Billerica,	W. H. O'Brien,	4
475-L-1, Woonsocket.	Thomas Reilly,	Blackstone,	P. J. Gibbons,	6
10-1,	H. K. Herrick,	Blandford,	- -	-
9-21,	Everett M. Walcott,	Bolton,	C. E. Mace,	5
- -	- -	Boston,	D. H. Sullivan,	-
- -	Emory A. Ellis, Bournedale.	Bourne,	Edward D. Nickerson.	10
11-4, West Acton,	M. L. Wetherbee,	Boxborough,	C. E. Sherry,	5
- -	Harry L. Cole, Georgetown, R. F. D.	Boxford,	C. Perley,	3
17-3,	H. J. Shattuck,	Boylston,	R. B. Smith,	6
- -	James M. Cutting, South Braintree.	Braintree,	O. A. Hubbard,	8
No telephone,	T. B. Tubman,	Brewster,	J. E. Eldridge,	10
8-6,	Edwin S. Rhoades,	Bridgewater,	A. W. McFarland,	7
14-3,	Geo. E. Hitchcock,	Brimfield,	G. E. Hitchcock,	6
1041,	Harry L. Marston,[1]	Brockton,	R. H. Carr,	7
- -	Elbert L. Bemis,	Brookfield,	J. H. Conant,	6
376,	Geo. H. Johnson,[1]	Brookline,	D. G. Lacy,	-
Lampson & Goodnow Mfg. Co.	Wm. Sauer, Shelburne Falls.	Buckland,	- -	-
2-5,	Walter W. Skelton,	Burlington,	W. W. Skelton,	1
21060,	Lawrence Horton, Ponkapog.	Canton,	A. Hemenway,	7
- -	- -	Cambridge,	J. F. Donnelly,	1
8166, Concord,	Geo. E. Wilkins,	Carlisle,	G. G. Wilkins,	1
16-2,	Herbert F. Atwood,	Carver,	H. F. Atwood,	9

[1] Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
W. N. Potter & Co.	Fred D. Legate,	Charlemont,	– –	–
32-3,	Carlos Bond, Charlton Depot.	Charlton,	J. D. Fellows,	6
11-12,	Geo. W. Ryder, West Chatham.	Chatham,	G. B. Bassett,	10
1597-4, Lowell,	Arnold C. Perham,	Chelmsford,	M. A. Bean,	4
– –	– –	Chelsea,[2]	J. A. O'Brien,	1
167-3,	Chas. D. Cummings,	Cheshire,	– –	–
8-2,	Myron E. Turner,	Chester,	– –	–
8004,	Chas. A. Bisbee, Bisbees,	Chesterfield,	– –	–
1492,	John E. Pomphret,[1]	Chicopee,	Z. Pilland,	6
No telephone,	Ernest C. Mayhew,	Chilmark,	A. S. Tilton,	10
– –	Edward Newton, North Adams, R. F. D.	Clarksburg,	– –	–
12-J,	Albert Fairbanks,	Clinton,	John Martin,	5
177-3 or 260,	Wm. J. Brennock,	Cohasset,	J. E. Grassie,	8
– –	J. D. Gilchrest,	Colrain,	– –	–
– –	Frank W. Holden,	Concord,	H. P. Richardson,	5
5-3,	Edgar Jones,	Conway,	– –	–
8001,	W. S. Gabb,	Cummington,	– –	–
58-11,	A. K. Cleveland,	Dalton,	– –	–
No telephone,	Thos. L. Thayer, North Dana.	Dana,	T. L. Thayer,	6
277-3,	Michael H. Barry,	Danvers,	G. E. Lame,	2
1383-41, New Bedford.	S. P. Hawes,	Dartmouth,	E. M. Munson,	10
35-R,	H. J. Harrigan,	Dedham,	J. T. Kennedy,	7
273-14, Greenfield,	Wm. L. Harris,	Deerfield,	– –	–
No telephone,	Alpheus P. Baker, South Dennis.	Dennis,	H. H. Sears,	10
29-3,	Ralph Earle,	Dighton,	D. F. Lane,	9
East Douglas, Central.	Wm. L. Church,	Douglas,	T. J. Libby,	6
373-1,	John Breagy,	Dover,	H. L. McKenzie,	7
3353-2,	Frank H. Gunther,	Dracut,	T. F. Carrick,	4
152-2,	F. A. Putnam,	Dudley,	I. H. Esterbrook,	6
No telephone,	A. W. Swallow,	Dunstable,	W. H. Savill,	4
22-2,	E. W. Soule, Box 15, Millbrook.	Duxbury,	H. A. Fish,	9
146-5,	R. H. Copeland, Elmwood.	E. Bridgewater,	Frank H. Taylor,	7
4-3,	E. J. Speight,	E. Longmeadow,	– –	–
– –	Adin L. Gill, North Eastham.	Eastham,	N. P. Clark,	10
2-11,	J. M. Dineen,	Easthampton,	– –	–
24-7,	John Baldwin, North Easton.[1]	Easton,	R. W. Melendy,	7
241-2,	Manuel S. Roberts,	Edgartown,	T. S. Wimpenny,	10

[1] Chief of fire department.

[2] No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
165-14, Gt. Barrington.	F. W. Bradford, Great Barrington.	**Egremont,**	- -	-
1-13,	Harry L. Ryther,	**Enfield,**	Clinton Powell,	6
No telephone,	Chas. H. Holmes, Farley,	**Erving,**	- -	-
23-5,	Otis O. Story,	**Essex,**	O. O. Story,	2
- -	- -	**Everett,**[2]	J. Davidson,	1
1426-2 or 3493-3,	Wm. P. Shaw,	**Fairhaven,**	G. W. King,	10
- -	James H. Nugent,	**Fall River,**	J. H. Nugent,	10
136-2,	H. H. Lawrence, Teaticket.	**Falmouth,**	W. B. Bosworth,	10
1421-W or 745,	W. W. Colton,	**Fitchburg,**	W. W. Colton,	5
Hoosac Tunnel Pay Station.	H. B. Brown, Drury,	**Florida,**	- -	-
15-5 or 76-5,	Ernest A. White,[1]	**Foxborough,**	S. J. Johnston,	7
352-4 So. Framingham.	B. P. Winch,	**Framingham,**	N. I. Bowditch,	7
67-3,	E. S. Cook,	**Franklin,**	J. W. Stobbart,	7
- -	Andrew Hathaway, Assonet.	**Freetown,**	G. M. Nichols,	9
191-M,	Geo. S. Hodgman,	**Gardner,**	T. W. Danforth,	6
- -	Leander B. Smalley, Menemsha.	**Gay Head,**	J. W. Belain,	10
4-2,	Clinton J. Eaton,	**Georgetown,**	C. J. Eaton,	3
4-15 Bernardston,	Lewis C. Munn, Turners Falls.	**Gill,**	A. Tuttle,	6
547-5,	Sydney F. Haskell,	**Gloucester,**	H. J. Worth,	2
18-4,	John S. Mollison, Williamsburg.	**Goshen,**	- -	-
- -	Rodney E. Bennett, Cuttyhunk.	**Gosnold,**	- -	-
Central,	Sumner F. Leonard,	**Grafton,**	C. K. Despeau,	6
55-4,	C. N. Rust,	**Granby,**	- -	-
4-12,	Lawrence F. Henry,	**Granville,**	- -	-
5-3,	Daniel W. Flynn,	**Gt. Barrington,**	T. J. Kearin,	6
443-M,	J. W. Bragg,	**Greenfield,**	J. W. Bragg,	6
33-24,	Wm. H. Walker, Greenwich Village.	**Greenwich,**	B. A. Sawtelle,	6
105,	J. B. Harrington,	**Groton,**	J. F. Bateman,	4
1026-X,	Sidney E. Johnson,	**Groveland,**	R. B. Larive,	3
651-33,	Edward P. West,	**Hadley,**	- -	-
5-3, Bryantville,	Jared B. Baker,	**Halifax,**	F. D. Lyons,	9
No telephone,	Fred Berry, Essex, R. F. D.	**Hamilton,**	E. G. Brewer,	2
- -	Walter S. Beebe,	**Hampden,**	- -	-
Post office,	Chas. F. Tucker,	**Hancock,**	- -	-
8011-2,	Chas. E. Damon, North Hanover.	**Hanover,**	L. Russell,	9
8012-6, Bryantsville,	Albert L. Dame, South Hanson.	**Hanson,**	A. L. Dame,	9
No telephone,	P. J. Humphrey,	**Hardwick,**	P. J. Humphrey,	6

[1] Chief of fire department.

[2] No forest area.

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
46-3,	Benj. J. Priest,	**Harvard,**	G. C. Maynard,	5
Central,	John Condon,	**Harwich,**	Arthur F. Cahoon,	10
6-3,	John M. Strong, West Hatfield.	**Hatfield,**	John M. Strong,	6
4-2,	John B. Gordon,	**Haverhill,**	M. Fitzgerald,	4
121-3,	Melvin H. White, Charlemont.	**Hawley,**	– –	–
5-18,	S. G. Benson,	**Heath,**	– –	–
21305,	Geo. Cushing,[1]	**Hingham,**	T. L. Murphy,	8
– –	E. H. Goodrich,	**Hinsdale,**	– –	–
150, Randolph,	E. W. Austin,[1]	**Holbrook,**	F. T. White,	7
29-4,	Winfred H. Stearns, Jefferson.	**Holden,**	W. H. Stearns,	6
5-21,	Oliver L. Howlett, Southbridge, R. F. D.	**Holland,**	A. F. Blodgett,	6
1-2,	W. A. Collins,	**Holliston,**	Herbert E. Jones,	7
R. H. Dietz,	Cornelius J. Haley,	**Holyoke,**	– –	–
233-2,	Walter F. Durgin,	**Hopedale,**	W. F. Durgin,	6
Central,	R. I. Frail,	**Hopkinton,**	W. A. Macmillan,	6
25-13,	E. A. Young,	**Hubbardston,**	E. A. Young,	6
207-M,	Wm. L. Wolcott,[1]	**Hudson,**	F. P. Hosmer,	5
248-W,	Smith F. Sturges, Allerton.	**Hull,**	J. Knowles,	8
– –	Fred P. Stanton,	**Huntington,**	– –	–
42-6 or 100,	A. J. Barton,	**Ipswich,**	J. Morey,	3
– –	Arthur B. Holmes,	**Kingston,**	R. F. Randall,	9
261-2,	Nathan F. Washburn,	**Lakeville,**	N. F. Washburn,	10
218-13,	Arthur W. Blood,	**Lancaster,**	L. R. Griswold,	5
717-5, Pittsfield,	King D. Keeler,	**Lanesborough,**	– –	–
90,	Dennis E. Carey,	**Lawrence,**	I. B. Kelly,	4
66-5,	James W. Bossidy,	**Lee,**	– –	–
No telephone,	Chas. White, Cherry Valley.	**Leicester,**	J. H. Woodhead,	6
135,	O. R. Hutchinson,	**Lenox,**	M. O'Brien,	6
546 or 9,	Fred A. Russell,	**Leominster,**	D. E. Bassett,	5
9-44, Cooleyville,	O. C. Marvel, North Leverett.	**Leverett,**	– –	–
No telephone,	Azor P. Howe,	**Lexington,**	A. P. Howe,	1
248-11,	Jacob Sauter,	**Leyden,**	– –	–
56-5,	J. J. Kelliher, Concord, R. F. D.	**Lincoln,**	J. J. Kelliher,	5
17-4,	A. E. Hopkins,	**Littleton,**	A. E. Hopkins,	5
1233-2,	Oscar C. Pomeroy,	**Longmeadow,**	– –	–
201-21,	E. S. Hosmer,[1]	**Lowell,**	C. A. Whittet,	4
17-13,	Edward E. Chapman,	**Ludlow,**	– –	–

[1] Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
20, . . .	James S. Gilchrest, . .	**Lunenburg,** .	James S. Gilchrest,	5
1174, . . .	Herbert C. Bayrd, . .	**Lynn,** . . .	G. H. McPhetres, .	2
No telephone, .	Thos. E. Cox, Wakefield, R. F. D.	**Lynnfield,** . .	L. H. Twiss, .	1
– –	M. F. Enwright, . .	**Malden,** . .	W. B. Gould, .	1
283-2, . . .	John D. Morrison, . .	**Manchester,** .	J. D. Morrison, .	2
1-2, . . .	Herbert E. King,[1] . .	**Mansfield,** . .	Marvin J. Hills, .	7
No telephone, .	John T. Adams, . .	**Marblehead,** .	W. H. Stevens, .	2
117-2, . . .	Geo. B. Nye, . . .	**Marion,** . .	J. Allanack, . .	10
345-2, . . .	E. C. Minehan,[1] . .	**Marlborough,** .	M. E. Lyons, .	5
43-3, . . .	Wm. G. Ford, . . .	**Marshfield,** . .	P. R. Livermore, .	9
19-11 or 19-4, Cotuit.	Joseph A. Peters, . .	**Mashpee,** . .	W. F. Hammond,	10
25-2, . . .	E. C. Stetson, . . .	**Mattapoisett,** .	A. H. Dexter, .	10
123-11, . .	G. A. Gutteridge, . .	**Maynard,** . .	A. Coughlan, .	5
106-4, . . .	W. E. Kingsbury,[1] . .	**Medfield,** . .	G. L. L. Allen, .	7
138 or 53, . .	Chas. E. Bacon, . .	**Medford,** . .	W. J. Gannon, .	–
15-2 or 38-3, .	Clyde C. Hunt,[1] . .	**Medway,** . .	F. Hager, . .	7
– –	– –	**Melrose,** . .	J. J. McCullough, .	1
156-6, . . .	Frank M. Aldrich, . .	**Mendon,** . .	F. M. Aldrich, .	6
21-3, . . .	Edgar P. Sargent, . .	**Merrimac,** . .	C. R. Ford, . .	3
No telephone, .	Herbert Nichols, . .	**Methuen,** . .	A. H. Wagland, .	4
5 or 36, . .	Chester E. Weston, . .	**Middleborough,**	A. D. Nelson, .	9
9024-14, . .	Thos. H. Fleming, Bancroft.	**Middlefield,** .	– –	–
– –	Chas. O. Currier, . .	**Middleton,** . .	B. T. McGlauflin,	3
65-3, . . .	E. M. Crockett, . .	**Milford,** . .	P. F. Fitzgerald, .	6
– –	Harry L. Snelling, . .	**Millbury,** . .	E. F. Roach, .	6
5-2, . . .	Chas. La Croix, . .	**Millis,** . . .	E. W. Stafford, .	7
322, . . .	N. T. Kidder, . . .	**Milton,** . .	N. T. Kidder, .	8
No telephone, .	S. R. Tower, . . .	**Monroe,** . .	– –	–
12-22, . . .	O. E. Bradway, . .	**Monson,** . .	– –	–
278-15, Greenfield,	Fred T. Lyman, . .	**Montague,** . .	Dennis J. Shea, .	6
Post office, . .	D. C. Tyron, . . .	**Monterey,** . .	– –	–
3-24, Russell, .	Andrew J. Hall, . .	**Montgomery,** .	– –	–
No telephone, .	G. W. Patterson, . .	**Mt. Washington,**	– –	–
138, . . .	Thos. Roland, . . .	**Nahant,**[2] . .	T. Roland, . .	2
16-21, . . .	Geo. M. Winslow, . .	**Nantucket,** .	G. M. Winslow, .	10
31, . . .	B. E. Darling, . . .	**Natick,** . .	H. S. Hunnewell, .	7
195-1, . . .	Howard H. Upham,[1] .	**Needham,** . .	E. E. Riley, . .	7

[1] Chief of fire department.

[2] No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
No telephone, .	Chas. S. Baker, . .	**New Ashford,** .	– –	–
2280, . . .	Edward F. Dahill,[1] .	**New Bedford,** .	C. F. Lawton, .	10
31-15, North Brookfield.	E. L. Havens, . . .	**New Braintree,** .	E. L. Havens, .	6
– –	Henry P. Stanton, . .	**N. Marlborough,**	– –	–
Pay station, .	Rawson King, Cooleyville.	**New Salem,** .	R. King, . .	6
173-1, Newburyport.	Wm. P. Bailey, Byfield, .	**Newbury,** . .	H. L. Bailey, .	3
380, . . .	Chas. P. Kelley, . .	**Newburyport,** .	C. P. Kelley, .	3
N. W., 33-1, .	W. B. Randlett,[1] Newton Center.	**Newton,** . .	C. I. Buckman, .	1
41-5, . . .	Jas. T. Buckley, . .	**Norfolk,** . .	James T. Buckley,	7
205-4, . . .	H. J. Montgomery,[1] .	**North Adams,** .	H. E. Blake, .	6
821-3, . . .	Geo. A. Rea, . . .	**North Andover,** .	Joseph W. Crockett,	4
17-3 or 209, . .	Preston D. White, . .	**N. Attleborough,**	F. P. Toner, . .	7
26-14, . . .	Geo. O. Rollins,[1] . .	**N. Brookfield,** .	S. D. Colburn, .	6
33-3, . . .	Henry Upton,[1] . .	**North Reading,** .	G. E. Eaton, .	1
165, . . .	F. E. Chase, . . .	**Northampton,** .	Christopher Clarke,	6
14-5, . . .	T. P. Haskell, . . .	**Northborough,** .	T. P. Haskell, .	6
71-5, Whitinsville,	W. E. Burnap, Whitinsville.	**Northbridge,** .	A. F. Whitin, .	6
2-3, . . .	Fred W. Doane, . .	**Northfield,** . .	F. W. Doane, .	6
29-11, . . .	Geo. H. Storer, . .	**Norton,** . .	G. H. Storer, .	7
11-4, . . .	John Whalen, . . .	**Norwell,** . .	J. H. Sparrell, .	9
55-4, . . .	Frank W. Talbot, . .	**Norwood,** . .	Ebin F. Gay, .	7
– –	Frank W. Chase, . .	**Oak Bluffs,** .	P. P. Hurley, .	10
17-5, . . .	C. H. Trowbridge, . .	**Oakham,** . .	C. H. Trowbridge,	6
67-13, . . .	F. M. Jennison, . .	**Orange,** . .	F. M. Jennison, .	6
21-12, . . .	Chas. F. Poor, . . .	**Orleans,** . .	A. Smith, . .	10
– –	Durand A. Witter, . .	**Otis,** . . .	– –	–
9-5, . . .	Olin D. Vickers, . .	**Oxford,** . .	C. G. Larned, .	6
65-11 or 53-3, .	James Summers,[1] . .	**Palmer,** . .	C. H. Keith, .	6
– –	Fred L. Durgin, . .	**Paxton,** . .	F. L. Durgin, .	6
18-3, . . .	M. V. McCarthy, . .	**Peabody,** . .	J. F. Callahan, .	1
– –	Myron N. Allen, . .	**Pelham,** . .	– –	–
7-23, Bryantville,	Jos. J. Shepard, . .	**Pembroke,** . .	J. J. McFarlen, .	9
54-3 or 12-5, .	Geo. G. Tarbell, . .	**Pepperell,** . .	J. Tune, . .	4
– –	Walter H. Pike, . .	**Peru,** . . .	– –	–
13-2, . . .	Geo. P. Marsh, . .	**Petersham,** . .	David Broderick,	6
176-6, Athol, .	W. H. Cowlbeck, Athol, R. F. D., 3.	**Phillipston,** .	W. H. Cowlbeck, .	6
149 or 964, . .	Wm. C. Shepard,[1] . .	**Pittsfield,** . .	– –	–

[1] Chief of fire department.

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
18-31, Cummington Exchange.	E. L. Parker,	Plainfield,	– –	–
– –	R. P. Rhodes,	Plainville,	C. N. Snell,	7
197-W or 88-4,	Herbert Morissey,	Plymouth,	A. A. Raymond,	9
11-14, Kingston,	T. W. Blanchard,	Plympton,	D. Bricknell,	9
19-4,	A. W. Doubleday,	Prescott,	C. M. Pierce,	6
13-4,	Fred W. Bryant,	Princeton,	F. A. Skinner,	6
– –	– –	Provincetown,	J. M. Burch,	10
– –	A. L. Litchfield,	Quincy,	A. J. Stewart,	8
86-W,	Chas. A. Wales,	Randolph,	C. F. Blanche,	7
1284-R,	John V. Festing,	Raynham,	G. M. Leach,	9
– –	H. E. McIntire,	Reading,	H. M. Donegan,	1
11-12,	Benj. F. Monroe, Attleborough, R. F. D.	Rehoboth,	S. W. Robinson,	9
– –	– –	Revere,[2]	G. P. Babson,	1
4-2,	T. B. Salmon,	Richmond,	– –	–
No telephone,	D. E. Hartley, Mattapoisett, R. F. D.	Rochester,	G. W. Wilcox,	10
55-4,	John H. Burke,	Rockland,	F. H. Shaw,	9
27-3,	A. J. McFarland,	Rockport,	F. A. Babcock,	2
21-6,	Merritt A. Peck, Zoar,	Rowe,	– –	–
No telephone,	Daniel O'Brien,	Rowley,	L. R. Bishop,	3
279-2, Athol,	L. G. Forbes,	Royalston,	A. H. Brown,	6
194, Springfield,	S. S. Shurtleff,	Russell,	– –	–
13-3,	Henry Converse,	Rutland,	H. E. Wheeler,	6
– –	– –	Salem,[2]	A. Stillman,	2
– –	James Pike,	Salisbury,	H. C. Rich,	3
Post office,	Lyman H. Clark, New Boston.	Sandisfield,	– –	–
52-14,	John F. Carlton,	Sandwich,	B. F. Denison,	10
115-3,	Chas. L. Davis,	Saugus,	T. E. Berrett,	1
3-3,	H. H. Fitzroy,	Savoy,	– –	–
– –	Henry T. Cole,[1]	Scituate,	P. S. Brown,	8
399-L-5, Pawtucket.	John L. Baker,	Seekonk,	H. L. Thompson,	9
121-2,	A. A. Carpenter,	Sharon,	J. J. Geissler,	7
24-2,	Arthur H. Tuttle,	Sheffield,	– –	–
135-4,	H. O. Fiske, Shelburne Falls.	Shelburne,	– –	–
11-4, Natick,	Milo F. Campbell, South Sherborn.	Sherborn,	J. P. Dowse,	7
– –	A. A. Adams,	Shirley,	A. A. Adams,	5
– –	Edward A. Logan,	Shrewsbury,	C. R. Webb,	6

[1] Chief of fire department.

[2] No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
2-14, . . .	N. J. Hunting, . .	**Shutesbury,** .	– –	–
– –	Wm. F. Griffiths, Swansea, R. F. D.	**Somerset,** . .	C. Riley, . .	9
– –	– –	**Somerville,**[2] .	A. B. Pritchard, .	1
724-1, Holyoke, .	Lewis H. Lamb, South Hadley Falls.	**South Hadley,** .	– –	–
153-2, . . .	Dana Howland, . .	**Southampton,** .	– –	–
13, Marlborough,	Harry Burnett, . .	**Southborough,** .	H. Burnett, .	6
11, . . .	Aimee Langevin, . .	**Southbridge,** .	A. Langevin, .	6
– –	Benj. M. Hastings, . .	**Southwick,** .	– –	–
77-4, . . .	A. F. Howlett, . .	**Spencer,** . .	G. Ramer, . .	6
20, Indian Orchard.	T. J. Clifford, Indian Orchard.	**Springfield,** .	W. F. Gale, . .	6
16-2, . . .	G. F. Herbert, Pratts Junction.	**Sterling,** . .	J. H. Kilburn, .	5
Post office, . .	Geo. Schneyer, Glendale,	**Stockbridge,** .	Dr. H. C. Haven, .	6
207-R, . .	Louis F. Bruce, . .	**Stoneham,** . .	G. M. Jefts, . .	1
121-3, . . .	James Curley, . . .	**Stoughton,** .	W. P. Kennedy, .	7
145-R, Hudson, .	W. H. Parker, Gleasondale.	**Stow,** . . .	G. A. Patterson, .	5
3-16, . . .	Chas. M. Clark, Fiskdale,	**Sturbridge,** .	C. M. Clark, .	6
5-5, . . .	S. W. Hall, South Sudbury.	**Sudbury,** . .	W. E. Baldwin, .	5
46, . . .	A. C. Warner, . . .	**Sunderland,** .	– –	–
49-16, . . .	R. H. Richardson, . .	**Sutton,** . .	J. E. Gifford, .	6
3106-3, . .	Geo. P. Cahoon,[1] . .	**Swampscott,** .	E. P. Mudge, .	2
– –	Thos. L. Mason, . .	**Swansea,** . .	A. E. Arnold, .	9
320 or 1-3, . .	Fred A. Leonard,[1] . .	**Taunton,** . .	L. W. Hodgkins, .	9
23-3, . . .	A. R. Paine, Baldwinsville,	**Templeton,** .	J. B. Wheeler, .	6
12-2, . . .	Harris M. Briggs, . .	**Tewksbury,** .	H. M. Briggs, .	4
102-3, . . .	E. C. Chadwick, Vineyard Haven.	**Tisbury,** . .	H. W. McLellan, .	10
– –	Clayton H. Deming, .	**Tolland,** . .	– –	–
Central, . .	Chas. W. Floyd, . .	**Topsfield,** . .	C. W. Floyd, .	3
11-2 or 37-2, .	F. J. Piper,[1] . . .	**Townsend,** . .	G. E. King, . .	4
No telephone, .	Naylor Hatch, . .	**Truro,** . . .	J. H. Atwood, .	10
6-4, . . .	Otis L. Wright, . .	**Tyngsborough,** .	C. J. Allgrove, .	4
1-22, Lee, . .	Geo. F. Knapp, . .	**Tyringham,** .	– –	–
7-2, . . .	E. M. Baker,[1] . .	**Upton,** . .	G. H. Evans, .	6
31-12, . . .	Lewis F. Rawson, . .	**Uxbridge,** . .	L. F. Rawson, .	6
455-M or 58, .	Wm. E. Cade,[1] . .	**Wakefield,** . .	W. W. Whittredge,	1
No telephone, .	Warren W. Eager, . .	**Wales,** . . .	M. C. Royce, .	6
112-2, . . .	Horace A. Spear, Jr., .	**Walpole,** . .	P. R. Allen, . .	7

[1] Chief of fire department.

[2] No forest area.

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
Post office, . .	Geo. L. Johnson, . .	**Waltham,** . .	W. M. Ryan, .	1
5-13, . . .	L. A. Charbonneau, . .	**Ware,** . . .	F. Zeissig, . .	6
45-23, . . .	Delbert C. Keyes, South Wareham.	**Wareham,** . .	J. J. Walsh, . .	10
No telephone, .	Jos. D. Vigneaux, West Warren.	**Warren,** . .	A. A. Warriner, .	6
73-3, . . .	Chas. A. Williams, . .	**Warwick,** . .	G. D. Sheperdson,	6
– –	Lester Heath, . .	**Washington,** .	– –	–
116, Newton North.	John C. Ford, . . .	**Watertown,** .	J. C. Ford, . .	1
56-4, Natick, .	C. S. Williams, Cochituate.	**Wayland,** . .	D. J. Graham, .	5
113-4, . . .	Timothy Toomey, . .	**Webster,** . .	C. Klebart, . .	6
126-9, . . .	Richard F. Evans,[1] .	**Wellesley,** . .	F. M. Abbott, .	7
– –	John Holbrook, . .	**Wellfleet,** . .	E. S. Jacobs, .	10
– –	Geo. J. Newhall, . .	**Wendell,** . .	G. E. Mills, .	6
74-2, . . .	Jacob D. Barnes, . .	**Wenham,** . .	J. D. Barnes, .	2
3-21, . . .	Fred E. Clark, . .	**West Boylston,** .	C. H. Baldwin, .	6
768, . . .	W. P. Laughton, . .	**W. Bridgewater,** .	O. Belmore, .	7
No telephone, .	J. H. Webb, . . .	**W. Brookfield,** .	J. H. Webb, . .	6
5-4, . . .	Moses Smith, . . .	**W. Newbury,** .	Frank D. Bailey, .	3
691-12, . .	A. A. Sibley, . . .	**W. Springfield,** .	– –	6
– –	Geo. B. Latour, . .	**W. Stockbridge,** .	– –	–
203-23, . .	Wm. J. Rotch, . . .	**West Tisbury,** .	H. W. Athearn, .	10
No telephone, .	J. H. McDonald,[1] . .	**Westborough,** .	Wm. Halloran, Jr.,	6
111-Y, . .	T. H. Mahoney,[1] . .	**Westfield,** . .	– –	–
14-3, . . .	John A. Healey, Graniteville.	**Westford,** . .	H. L. Nesmith, .	4
– –	C. A. Bartlett, . .	**Westhampton,** .	– –	–
15-22, . . .	John C. Goodridge, .	**Westminster,** .	S. Whitney, . .	6
255-2, Waltham, .	Edward P. Ripley, . .	**Weston,** . .	E. P. Ripley, .	5
No telephone, .	Herbert A. Sanford, North Westport.	**Westport,** . .	H. A. Sanford, .	10
336, West Dedham,	Percy R. Dean, Islington,	**Westwood,** . .	C. H. Southerland,	7
– –	Edgar S. Wright, South Weymouth.	**Weymouth,** .	C. L. Merritt, .	8
69-2, South Deerfield.	James A. Wood, East Whately.	**Whately,** . .	– –	–
28-14, . . .	C. A. Randall, . .	**Whitman,** . .	C. A. Randall, .	9
1-4, . . .	Henry I. Edson, North Wilbraham.	**Wilbraham,** .	H. Starr, . .	6
37-21, . . .	Fred J. Vining, Haydenville.	**Williamsburg,** .	– –	–
– –	William Davies, . .	**Williamstown,** .	– –	–
34-4, . . .	Howard M. Horton, .	**Wilmington,** .	O. McGrane, .	1
29, . . .	Arlon D. Bailey, . .	**Winchendon,** .	G. W. Drury, .	6

[1] Chief of fire department.

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
123-2, . . .	David H. DeCourcy,[1] .	Winchester, .	S. S. Symmes, .	1
203-12, Dalton, .	Chas. D. Galusha, .	Windsor, . .	- -	-
- -	- -	Winthrop,[2] . .	J. A. Barry, .	1
110, . . .	Frank E. Tracy,[1] . .	Woburn, . .	J. H. Kelley, .	1
1947-W, . .	Arthur V. Parker, . .	Worcester, . .	H. J. Neale, . .	6
- -	Chas. Kilbourn, . .	Worthington, .	- -	-
21-3, . . .	D. Stanley Stone, . .	Wrentham, . .	W. Gilmore, . .	7
- -	Jos. W. Hamblin, . .	Yarmouth, . .	C. R. Bassett, .	10

[1] Chief of fire department. [2] No forest area.

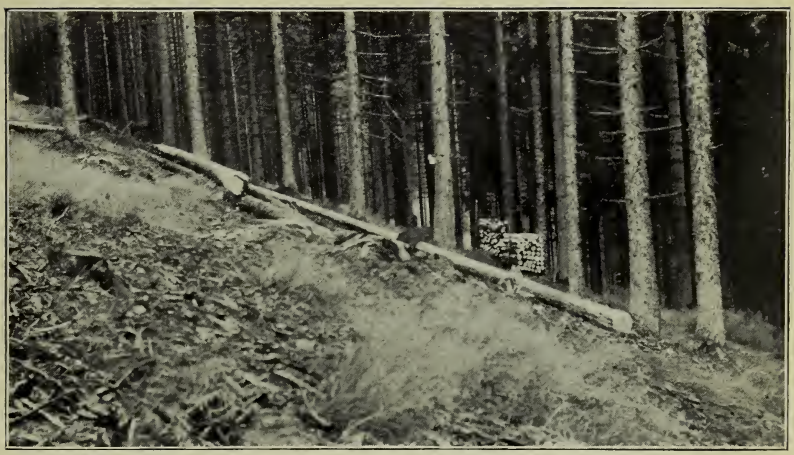
Trip to Europe.

The State Forester was sent as a delegate to attend the meeting of the Second International Entomological Congress, which convened at Oxford, Eng., August 4 to 10, and to the Black Forest of Germany to study forestry conditions. The entire trip of six weeks was not only of great interest, but it is hoped it will prove of value in the State work. At Oxford there was an assembly of entomologists from all over the world, fourteen from America. The meetings were held in the old historic University buildings of Oxford, and the deliberations were of a very high order and participated in in three languages, namely, English, French and German. Specialists were present who knew insect life of every phase, species and country, and it was an exceptional opportunity to exchange ideas and secure new information. The work of the suppression of the gypsy and brown-tail moths in Massachusetts I found was familiar to all, and in fact Massachusetts, its undertakings and accomplishments in its insect warfare, was frequently alluded to by various delegates as meriting the congratulations of all countries of the world. In talking with the delegates from other nations, and especially with those who had observed the habits of these insects in countries other than their own, it was interesting to compare their observations with our own. Instinctively, when in England, I found myself looking the trees over for the accustomed insect life, but without avail.

In talking with Dr. T. Algernon Chapman, an English entomologist, I was informed that, in his desire to propagate the gypsy moth in order to have plenty of specimens, he had actually imported them into England, and had endeavored to establish them on fruit trees at different times, but his undertakings had been a complete failure. In talking with Oberforester Fleck of Frankfort, Ger., I found that, while the gypsy moth was a harmful insect, nevertheless it appeared in sufficient numbers to be destructive only once in ten or twelve years, and even then the outbreak was nothing like that of our American infestation. One of the delegates reported that he had seen the gypsy moth in large numbers in northern Africa, where it had defoliated vegetation in a way similar to that in Massachusetts. Many others gave their experiences from observations, but, on the whole, they revealed nothing in addition to the facts given by Mr. W. F. Fiske and Dr. L. O. Howard, who have made a study personally of European and Japanese conditions, through the co-operative work on the part of Massachusetts and the United States Department of Agriculture.

From observations during my very brief stay in England, and from discussions with entomologists, I was particularly impressed with the fact that insect life generally never seems to reach the extremes there that it does in this country. This is true, I should say, not only in regard to insects affecting trees, but about those preying upon flowers and vegetables as well. It would seem to the writer that climatic conditions are largely responsible for this, for with such frequent precipitation vegetation is kept fresh and healthy, and at the same time insect life generally does not find the variety of conditions to favor its development which our climate, of greater extremes of heat and drought, assists. It may be that parasites are present and aid in keeping the balance, but it is believed that natural climatic conditions are great factors.

On the continent, conditions vary more or less from those of England, and outbreaks here seem to be more frequent and approach much nearer those in America; but even here the past season was comparatively cold and rainy, and therefore not as favorable to the development of insect life. I was, in fact, almost disappointed in not being able to find more forest insect depre-



A well-wooded mountainside of spruce in the Black Forest, Germany. These trees were all planted by the government and yield splendid returns.

A scene in the Black Forest, Germany, showing planted trees of all ages.

dations in the various countries than I did. I was interested in observing that while forest insects seem scarce, fruit insects and diseases seem relatively more numerous and destructive.

One thing that impressed the writer from a forestry standpoint was the definite system of management that prevailed, particularly in Belgium and Germany. With these countries their forestry is so reduced to definite rotations of tree crops, with comparatively few species, that the problem is a simple one. Our forestry conditions in Massachusetts, with the great variety of species, to say nothing of the varying ages and quality of the products, become conglomerate, showing a woeful lack of system in comparison. When we think of the Black Forest of Germany, we at once rightly associate it with spruce and fir, in the growing of which a great many depredations are eliminated, as neither the gypsy nor the brown-tail moth has to be considered, as neither attacks them. The beech forests, again, are quite another type, and hence their management, depredations, etc., require different treatment. In America it behooves us to establish similar policies, and thereby reduce silvicultural endeavors to systems that in themselves can be more easily and simply understood and handled.

In Belgium, the large national forest practically surrounding the city of Brussels was visited, and some time was spent in looking over the government's arboretum and nurseries, where most of our American species of trees are growing. It was like meeting old friends. Some of them seemed happy, while others were apparently more or less homesick.

In Switzerland my time was too short to make any extended trips, but in passing, a compliment should be given the Swiss foresters for the splendid results they have accomplished under many adverse conditions.

In Germany, several tramps were taken into the forest, sections of which were teeming with material for valuable observations and experiences. At Neustadt, Oberforester Wilder showed me every attention possible, and particularly emphasized his troubles as well as his successes. I was enabled here to see every phase of forestry work, from planting and nursery work through to the finished milled product. At Frankfort, Oberforester Fleck and Dr. M. Nassauer were particularly kind in showing me the forests

in that section, which are magnificent and alone worth the whole trip. A white pine stand fifty-five years of age was a splendid sight. (See frontispiece.) Trees of all ages and sizes can be seen here, and the experiments and results are very significant. At Darmstadt, the planting of sandy lands particularly was very interesting. Many other places were visited, each of which proved of more or less interest from a forestry standpoint, as to management, insect depredations, taxation, fire, etc., but it is my purpose to give a brief sketch of the trip at this time; other observations and notes taken at the time will be brought out later. No forester who is interested in his profession can go to the old world without securing a great fund of valuable suggestions and information that may prove of great profit to him in his life's work.

Better Forestry the Solution of the Moth Problem.

It may be recalled that the State Forester, upon assuming charge of the moth work, wrote a brief article for that year's annual report (1909, page 100) entitled "Modern Forestry and Insect Warfare." The purpose of calling attention to the same now, three years later, is to emphasize, with riper experience, the far-reaching application of the idea. The further we work and study on any problem the more the complex features fade away, and we finally get to the more simple and rational principles. The fight against gypsy and brown-tail moths has gone on up to now, and must continue, but it is believed that at the present time, although we have paid much for our experience and knowledge, we are in a far more satisfactory position to cope with them than most people realize. I do not wish to be misunderstood, for I am not saying that these insects are under control by any means, but I feel that if any intelligent person desires honestly to combat these pests, under any and all conditions, already there have been determined rational ways and methods which are effective.

Better methods of forestry management, which in the case of the moth-infested sections of the State will greatly depend upon silviculture, can be made extremely effective. Had we known what we do to-day it would have been a very simple thing to have saved the innumerable magnificent evergreens that were destroyed by the gypsy moth. As time has gone on, better organization and greater insistence for improved methods, materials, equip-

ment and machinery, together with natural and imported enemies and a more intimate knowledge of their workings, have all helped just so much. We need, therefore, combined co-operation to get the efficiency desired.

There is little question but that much of our work in the past, although effective, nevertheless has been altogether too expensive. The old idea of tearing down and burning out stone walls to destroy egg clusters appealed to some as effective, and it was, but to-day it is entirely abandoned. A few years ago burlap was used by hundreds of bales, and nearly every tree had a petticoat; but during the past season the ones seen were largely those hanging on from previous years, rather than new ones, other methods having proved better and taken their place.

To come to real fundamentals, our purpose in fighting the moths is to save our trees. We value our trees for two purposes — first their æsthetic value for ornamental shade and beauty; and second, their economic value, as lumber and other forest products.

To get the best results with trees it is necessary to comprehend their wants in a very broad way. Adaptation of soils, proper distance apart for development, protection from forest fires in the country and leaky gas pipes and pavements in the cities, fungous diseases, insects, etc., must all be considered, each in its proper time and place.

In order, therefore, to combat any one of the above conditions or depredations the case as a whole first needs diagnosing. Now, if the brown-tail moth is the greatest factor to contend with the simplest solution is to grow evergreens, eliminating the hardwoods, as the brown-tail never touches evergreens. There are whole forests of evergreens alone in Europe. In the case of the gypsy moth it also so happens that where there are clear stands of evergreens this insect is little to be feared. It is for this reason that on the North Shore, for example, it will be seen that the oaks, which this insect adores, and other hardwoods are cut out, and the evergreens, like pine and hemlock, are retained and encouraged.

Without going further into detail, the point I desire to make is that a trained forester can and will, through his knowledge of the difficulties likely to be encountered with the gypsy and brown-tail moths, select his species and prepare and handle his wood

lots or forests in such ways as to obviate the difficulties. Through our observations we have found that many of our hardwoods species also are comparatively immune from these moths. The ash, locust, hickory and others, if selected and planted independently of those trees most coveted by the moths, would be relatively free. (See table, page 29.) If, in addition to silvicultural methods, as indicated, we also practice up-to-date forestry management by keeping the stand thinned out of dead wood and inferior and weakened trees, the results would be appreciable. Forest fires running through woodlands leave them in an unhealthy and unprofitable state, and it is here that moths and other depredations get their start, as the owner loses interest in such growth and feels it is not worth working with. These become the breeding places that later cause so much trouble.

With modern methods of management our forests will improve in every way. A forest properly thinned is more easily cared for, no matter what attacks it. Wherever we find wild, neglected woodlands, thickets and tangles along highways, or run-down and neglected estates, there are invariably the places where we expect to find the gypsy moth entrenched.

The first thing to be done with all our woodlands, therefore, is to practice modern forestry management for the benefit of future products, regardless of moths or other depredations; then let come what may, conditions are of the best for overcoming them.

There is little to be gained in treating egg clusters and combating insects on dead, decaying or illshaped and weed trees and stumps, as one's efforts ought to be centered on those that have prospective value.

The State Forester and his staff of trained assistants stand ready to assist any and every one in the State in the practice of modern forestry management. This once well established we predict that the insect depredations will be largely under control.

Forest Trees resistant to the Gypsy Moth.

With a view to finding out which species of trees are most resistant to the gypsy moth under general forestry conditions, the following data as to the feeding habits were collected by a trained forester. The work extended from July 10 to July 24, in areas which had been stripped by the gypsy moth. Sixty-

five plots were made for the examinations, located in 39 areas of stripping in 16 towns and the city of Boston. On 42 of these plots the trees were counted by species in $\frac{1}{4}$-acre circles; 8 were in scrub growth, or not much larger; the others were taken wherever conditions were favorable for getting comparative conditions for a fair study. In every case an estimate was made of the percentage of stripping, by species.

The table shows the average percentage of strippings of the different species on the plots actually counted.

Percentage of Stripping.

Species.	Percentage.	Basis (Number of Trees).
White oak,	94.0	871
Red oak,	89.0	156
Black oak (including scarlet),	84.0	1,084
Chestnut,	63.0	39
Hickory,	37.0	104
Red maple,	20.0	67
Gray birch,	14.0	365
White birch,	1.5	4
Beech,	72.0	8
Ash,	12.0	31
Black locust,	2.5	2
White pine,	5.0	127
Pitch pine,	-	5
Red cedar,	-	43
Black birch,[1]	50.0	5[2]
Elm,[1]	10.0	5[2]
Scrub oak,[1]	88.0	50[2]

[1] Not on counted plots. [2] Estimated.

This gives a fair estimate of the comparative resistance to the gypsy moth of the different species, with the exception of red oak. It so happened that the greater number of trees of this species observed were on areas where the stripping was particularly heavy, while on the areas where the general stripping was lighter there were very few red oaks. Thus the average obtained is exceptionally large. The individual plots show that where red

oak occurred with one or more other species of oak, it was stripped on an average of 10 per cent. less than any other. The detailed figures of the separate plots are not submitted with this report, but are kept on file for reference if needed.

A number of cases were observed in which white oaks showed less stripping than the surrounding trees. In these cases the greater part of the white oak leaves were of recent growth. This and the presence of brown-tail pupa cases seemed to indicate that the white oaks had been stripped by brown-tails early in the season. At the time of the gypsy work there was little foliage left on these trees, and consequently the gypsy caterpillars either died or migrated to neighboring trees. The new leaves sprouted before the end of the gypsy season, but the caterpillars did not return to the white oaks.

Signs of the wilt disease were seen in most of the areas examined. In many cases this was undoubtedly natural.

A number of egg clusters were examined. None of these contained more than approximately 250 eggs, while many were much smaller. This is a natural result of the stripping, which prevented the caterpillars from obtaining their full growth.

Examinations of Woodlands.

Our well-founded policy of encouraging private woodland owners to manage their holdings according to established forestry principles has been continued very successfully during the past year. The number of examinations made (showing an increase over last year) seems to justify the hope, expressed in our last report, that this line of work is becoming sufficiently well known to be taken advantage of by citizens all over the State.

Chestnut Bark Disease.

While the number of examinations of woodland for the purpose of giving advice in forestry management has surpassed last year's mark, as noted, the work of examining for bark disease, which was then just beginning, has increased very rapidly indeed, so that in place of the 6 examinations made last year we are able to report a total of 28, not including several inspections made of lots previously examined. The wide prevalence of the disease

gives us every reason to believe that this work will increase rather than diminish during the coming year.

The two following tables give lists of the forestry and bark disease examinations made during the past year.

Examinee.	Town.	Area (Acres).	Cost.
Adams, Chas. F.,	Concord,	300	$0 75
Alexander, Samuel,	Northfield,	30	4 00
Allen, G. H.,	Billerica,	50	39
Amesbury Park Board,	Amesbury,	6	4 08
Andover Park Board,	Andover,	25	1 00
Angier, E. H.,	Ashland,	30	1 05
Balch, Anna L.,	Boston,	1	–
Balch, Francis N.,	Billerica,	87	40
Barton, N. B.,	Sharon,	2	50
Bay State Street Railway Company,	Avon,	6	45
Bay State Street Railway Company,	Dighton,	1	75
Bay State Street Railway Company,	Taunton,	10	75
Bay State Street Railway Company,	Westwood,	10	20
Brookline Water Commissioners,	Dedham,	–	–
Brookline Water Commissioners,	Needham,	–	–
Brookline Water Commissioners,	Boston,	350	–[1]
Clark, Mrs. Elton P.,	Framingham,	10	1 10
Commission Public Works,	Lynn,	2,600	40
Crane, Dr. Clarence E.,	Dover,	40	15
Crocker, Mrs. Annie W. P.,	Foxborough,	175	1 30
Curtis, Frederick H.,	Dover,	16	57
Dame, J. R.,	Marshfield,	40	1 28
Dean, Herbert W.,	Cheshire,	2	–[1]
Dennison Manufacturing Company,	Framingham,	52	1 00
Fales, L. F.,	Walpole,	60	1 00
Fitzpatrick, Thomas M.,	Hopkinton,	80	50
Fuller, Edward,	North Andover,	108	70
Gordon, Dr. W. C.	Littleton,	15	1 30
Guptill, H. E.,	Georgetown,	4	2 94
Hathaway, M. B.,	Wilmington,	36	80
Hillside Industrial School,	Greenwich,	8	–
Houghton, L. T.,	Sutton,	50	2 20
Hunnewell, Hollis,	Natick,	250	2 43

[1] Transportation furnished.

Examinee.	Town.	Area (Acres).	Cost.
Lawrence, James,	Groton,	250	$4 18
Lufkin, C. O.,	Hubbardston,	60	1 50
Lythgoe, Mrs. Wm. F.,	Sharon,	4	50
Manning, John B.,	Boston,	4	25
Marlborough Water Commissioners,	Marlborough,	20	1 16
McQuaid, John,	Pittsfield,	40	–[1]
Means, Anne M.,	Andover,	5	92
Merrill, Dr. John L.,	Pembroke,	36	–[1]
Morgan, Paul B.,	Hubbardston,	40	5 25
Mount Holyoke Company,	Hadley,	240	6 55
Osgood, Isaac,	North Andover,	7	75
Parkinson, John, Jr.,	Dover,	14	–
Peabody Water Works,	Peabody,	98	80
Pierce, M. E.,	Berkley,	75	–
Place, C. A.,	Sterling,	30	1 60
Rogers, Edward H.,	Lincoln,	25	80
Sanderson, Geo. A.,	Littleton,	100	1 08
Sedgwick, Ellery,	Ipswich,	40	1 25
Shaw, J. Holbrook,	Plymouth,	10	1 60
Souther, Mrs. C. H.,	Boston,	2	–
Springfield Water Commissioners,	Blandford,	5	–
Springfield Water Commissioners,	Belchertown,	5	4 50
Sudbury Poor Farm,	Sudbury,	100	74
Walpole, town of,	Walpole,	19	–[2]
Wellesley College,	Wellesley,	15	–[2]
Westborough Insane Hospital,	Westborough,	10	2 72
Whitin Machine Works,	Northbridge,	40	2 78
Total,		5,748	–

[1] Transportation furnished. [2] No expense.

Examinee.	Town.	Area (Acres).	Disease Present.	Cost.
Ames, John S.,	Easton,	100	(?)	$0 90
Ames, Oakes,	Easton,	100	Yes.	–
Bay State Street Railway Company,	Avon,	6	No.	–
Bird, C. S.,	Walpole,	50	Yes.	80
Bowlker, Nathaniel,	Framingham,	100	No.	–
Briggs, F. H.,	Sharon,	30	Yes.	–

View of a fireline at Darmstadt, Germany, taken by the Massachusetts State Forester. The soil is a deep sand and the trees are Pinus sylvestris. Our Cape lands are far superior to this.

A view of a paved street extending through the government forest in the proximity of Brussels, Belgium. This large forest tract is mostly beech, and is valued æsthetically as well as economically.

Examinee.	Town.	Area (Acres).	Disease Present.	Cost.
Burlen, Wm. H.,	Sherborn,	80	Yes.	–
Carpenter, S. I.,	Sharon,	6	Yes.	$0 80
Channing, Walter M.,	Wellesley,	47	Yes.	–
Clark, Mrs. Elton P.,	Framingham,	30	No.	–
Codman, M.,	Framingham,	10	No.	–
Daniels, F. T.,	Sherborn,	1 tree.	No.	–
Felton, Fred S.,	Bolton,	150	Yes.	1 60
Hannum, William H.,	Williamsburg,	200	Yes.	–
Hyde, Louis C. (trustee),	Chicopee,	400	Yes.	4 45
Hyde, Louis C. (trustee),	Springfield,			
Joslin, Elliott P.,	Oxford,	3	Yes.	–
Lasell, C. W.,	Northbridge,	10	No.	2 95
Marshall, Lewis P.,	Walpole,	10	No.	80
Metropolitan Water Board,	Marlborough,	–	Yes.	–
Metropolitan Water Board,	Clinton,	–	Yes.	–
Metropolitan Water Board,	Southborough,	50	Yes.	–
Packard, Mrs. J. S.,	Seekonk,	2	Yes.	2 00
Pearmain, J. D.,	Framingham,	70	Yes.	40
Pierce, Mrs. E. J.,	Newton,	½	No.	–
Saltonstall, John L.,	Bolton,	152	No.	1 00
Smith, Harry W.,	Grafton,	60	Yes.	1 30
Sylvester, H. D.,	Williamsburg,	20	Yes.	–
Trott, George S.,	Bolton,	5	No.	–
Warren, Fiske,	Harvard,	600	Yes.	2 77
Total,		2,291½	–	–

Surveying.

The work of surveying land turned over to the State for planting, mentioned in our last report, has this year been pushed to completion, so that we now have on file maps for all lots planted by us under the reforestation act. This undertaking has involved the survey and mapping of 22 separate lots of land in all parts of the State, comprising a total area of 915 acres. Following is a list of these lots: —

Name of Lot.	Town.	Area (Acres).
Ballou,	Shirley,	17½
Bent,	Hubbardston,	69
Bent,	Hubbardston,	111
Cadwell,	Pelham,	7½
Cadwell,	Pelham,	16½
Civic League,	Nantucket,	83
Clark,	Holden,	55
Dean,	Rutland,	55
Dewar,	Carlisle,	35
Fenno,	Westminster,	35
Flint,	Andover,	38
Fullam,	West Brookfield,	75½
Gerrett,	Greenfield,	4
Glazier,	Leverett,	66
Glazier,	Leverett,	25
Killam,	Rowley,	31
Lamb,	Hubbardston,	51
Parkinson,	Dover,	14
Stone,	Brookfield,	40
Wilson,	Spencer,	15
Wilson,	Spencer,	25
Wilson,	Spencer,	46
Total,		915

The total surveyed area for which maps have been made by the forestry department is now 1,558 acres.

Steven's Estate, Warwick.

In October of last year this office made an examination and report on 55 acres of land belonging to the Steven's estate in Warwick. One-half of this area had been logged some years before, and had come up to a growth of hardwood sprouts and bushes. We advised in our report that this land should be deeded to the Commonwealth and planted by this office under the terms of the reforestation act. This was done and the land was planted last spring.

About two-thirds of the remaining 30 acres was covered with a second-growth stand of tall sapling pines; the remaining third

held a hardwood stand of sprout chestnut, white birch, oak and maple. It was advised in our report that the pine stand should be thinned, that is, the crowded, slow-growing trees should be cut out, and that the chestnut and white birch among the hardwoods should be removed. It was thought advisable to cut the chestnut on account of the danger of infection by the chestnut bark disease, and the white birch, because it was mature and seemed to be deteriorating in quality.

The recommendations of our report in regard to the thinning were accepted by the trustees of the estate, and six of our men, with one of our most experienced foremen, were set to work in the woods. The Steven's estate paid the entire cost of the work, including the expenses of the forester from this office who marked the trees and supervised the work. Arrangements were made with Mr. Williams, a local lumberman, to take the logs on the ground for $8 per M feet. Considering the conditions this was a very fair price. The slash and dead wood were piled but not burned, as it seemed impossible to do this without scorching and killing many of the standing trees.

The financial results of this operation should interest those who have wood lots in which thinning is a possibility. The amount of lumber sawed from the logs came to 235,000 board feet, and at the selling price of $8 per 1,000 the gross returns were $1,880. The labor cost of chopping and slash piling was $600; tools, $30; supervision, *i.e.*, expenses of the forester, $25; miscellaneous, $15; total, $670, or $2.90 per 1,000 feet. This leaves a net return of $5.10 per 1,000 feet, — a very good margin of profit for an operation carried out primarily for improvement to a wood lot situated more than 10 miles from the railroad.

Experimental Thinning.

A work which should prove to be of considerable interest when the final results are obtained has been begun in the town of Cheshire. The object of this undertaking is to learn the cost of thinning out the valueless species among the thick second-growth hardwood which comes up on the slopes of the Berkshires after the older trees have been cut off.

These slopes are covered largely with this sort of growth, which in the course of fifty years or so, by a process of natural thinning,

again becomes fit for fuel. If it can be shown that the growth of these trees can be so hastened by cutting out the inferior species as to produce the same amount of fuel wood per acre in thirty-five to forty years as now grows in fifty, and if this work can be done for a sufficiently low price per acre to make the financial result profitable, then the purpose of this experiment will have been fulfilled. For a woodland owner can well afford to pay the cost of removing these poorer trees, even when too small to be of any value, provided the remaining trees grow much faster and straighter, and show better quality.

While it is our belief that this result will be accomplished, we have no actual data at hand to prove it. As we always have held that facts are more useful than theories, we hope by the time four or five years have elapsed to be able to show conclusive results.

The method of making the experiment was this: two quarter acre plots were laid off side by side, so marked as to be clearly distinguishable. One of these plots was left untouched; the other was marked by a forester and all the marked trees were cut and drawn out. Data as to costs, number of trees thinned, number left, etc., are not available at this writing, but soon will be, and examination of the plots from year to year will reveal the progress of the growth. When sufficient time has elapsed we hope to have at hand "visible" data, so to speak, of a sort which, so far as we know, does not now exist in this section of the country.

Forest Working Plan.

One working plan has been made this year for the forested watershed of the city of New Bedford, in the towns of Freetown, Lakeville, Middleborough and Rochester. As a printed report of the working plan has been published by the city only a brief summary will be given here.

The complete plan consists of (1) an examination, with estimates and recommendations; and (2) a forest map based upon surveys, both area and timber; it was made as the result of a preliminary examination made by us in September, 1911, and covers an area of 1,510 acres.

The growth was divided into types, each of which was estimated separately. Then general recommendations, divided principally into thinning, planting, establishment of a nursery and

provision for fire protection, were made, followed by specific treatment for each type. A table was included giving instructions for handling a given portion of the tract each year, so that after a certain period has elapsed the whole area will be under management.

The city has begun to follow out the recommendations made in the report, and last spring started a nursery under the direction of this office.

Reforestation.

The reforestation policy of this office has been gaining strength throughout the Commonwealth by the awakening of the interest of private land owners in this kind of work. The fact that New Hampshire is also endeavoring to pass a similar law shows our reforestation law to be one of merit.

The work done during the past four years under the provisions of the reforestation act is beginning to show the practicability of planting forest trees on our waste lands. The plantations set in 1909 and 1910 are now large enough to attract the attention of people passing by.

This office has, up to the present time, planted about 80 lots of land in different sections of the State. During the past summer all these plantations were inspected, and reports made on the conditions of each lot. Where a considerable number of trees had died from the severe drought of the summer of 1911, or from other causes, it was decided to fill in the blanks so caused with new trees. This part of the work has been pushed with vigor during this fall, so that now nearly all of the 1909 and 1910 plantations are in good condition, and need no further attention beyond the cutting of brush and protection from fire.

A few of the plantations set late in the spring of 1912 were somewhat affected by the drought of this past summer, and will require some filling in another year.

Twenty-nine plantations, comprising a total acreage of 810 acres, were set out this past year with three and four year old transplant stock, all raised in our own nursery at Amherst. The number of trees set amounted to more than a million.

We also cleared and burnt over an 87-acre tract of cut-over pine land upon which the slash was very dense. A fire line was built along the entire length of the west side of the lot where it

adjoins the railroad. This land will be planted the coming spring. We have on hand at this time about 500 acres of land for planting in 1913, and expect to add materially to this amount.

We feel that that portion of the reforestation law which limits the price of land to $5 per acre should be amended to read $10, because with the present low limit it is difficult to obtain land situated in places where the plantation can be seen by any considerable portion of the public, so that the educational effect of the law is largely lost.

Forest Nursery.

Our special appropriation of $4,000 for nursery work has enabled us to reach the goal which we have long desired, namely, to raise in our own nursery an amount of transplant stock sufficient for our own needs and also be able eventually to supply forest nursery stock to State institutions and commissions. During the past year we furnished the Metropolitan Water and Sewerage Board with 250,000, the Mt. Wachusett Reservation Commission with 20,000 and the Westfield State Sanatorium with 5,000 two-year-old white pine seedlings.

During the past few years we have lost a portion of our seedling and transplant stock from drought, and have been handicapped because there was no water supply at the nursery. This last spring we laid a water pipe, with uprights for hose connection at regular distances, in the Amherst nursery. This system was connected with that of the Massachusetts Agricultural College. At Sandwich we draw the water from a pond, and make use of one of the old discarded power sprayers transferred from the gypsy moth division for pumping purposes. This works well.

The seedlings of this year promise to make a fine stand and the transplants have also made remarkable growth. We have tried the experiment this year of doing a large amount of fall transplanting, and the small trees appear to be in fine condition and able to stand the coming winter weather. In addition to the stock at our Amherst and Sandwich nurseries we have at Hopkinton about 125,000 four-year-old white pine transplants which were not used this past year. The equipment at Amherst has been increased by a large shed to hold boxes and baskets, and at Sandwich a shed was built to hold the sprayer pump mentioned above.

From our nurseries we shall have on hand next spring over a million and a half three and four year old pine and spruce transplants, and a very large number of two and three year old seedlings. A table showing the stock in our various nurseries follows: —

SANDWICH NURSERY, 1912.

VARIETY.	Age (Years).	Number of Trees.
Catalpa speciosa seedlings,	3	3,000
Black locust seedlings,	4	8,500
Black locust seedlings,	3	4,700
Honey locust seedlings,	3	2,800
Scotch pine seedlings,	3	25,000
Scotch pine seedlings,	1	50,000
Austrian pine seedlings,	2	20,000
Pitch pine transplants,	4	114,000
Black locust transplants,	4	114,000
Norway spruce transplants,	3	85,500
Jack pine transplants,	3	500
Total,		428,000

HOPKINTON NURSERY, 1912.

White pine transplants,	4	125,000

AMHERST NURSERY, 1912.

White pine seedlings,	1	1,701,100
White pine seedlings,	2	1,332,800
White pine seedlings,	3	259,200
Red pine seedlings,	1	187,900
Norway spruce seedlings,	1	211,200
Norway spruce seedlings,	2	1,015,800
European larch seedlings,	1	47,500
White ash seedlings,	1	65,000
White ash seedlings,	2	7,500
Catalpa speciosa seedlings,	2	1,700
Chestnut seedlings,	2	1,000
Maple seedlings,	2	200
Total seedlings,		4,830,900

AMHERST NURSERY, 1912 — *Concluded.*

VARIETY.	Age (Years).	Number of Trees.
White pine transplants,	4	82,500
White pine transplants (spring),	3	725,300
White pine transplants (fall),	3	589,000
Norway spruce transplants,	4	15,000
Red pine transplants,	3	14,000
Fir balsam transplants,	3	22,400
Hemlock transplants,	3	2,800
Arborvitæ transplants,	3	7,000
Total transplants,		1,458,000
Grand total,		6,288,900

PLANTING DONE UNDER THE ADVICE OF THIS OFFICE.

NAME.	Town.	Variety.	Number of Trees.
Metropolitan Park Commission,	-	White pine,	250,000
Wachusett Reservation Commission.	-	White pine,	20,000
Daniel O'Brien,	Rowley,	White pine,	5,000
F. W. Williams,	Northfield,	White pine,	2,000
Marlborough Water Board,	Marlborough,	White pine,	20,000
Springfield Water Commission,	Blandford,	White pine,	5,000
Springfield Water Commission,	Belchertown,	White pine,	5,000
Charles G. Washburn,	Princeton,	White pine,	2,600
Fall River Water Commission,	Fall River,	White pine,	20,000
New Bedford Water Commission,	New Bedford,	White pine and Norway spruce.	30,000

STATE PLANTATIONS, 1912.

TOWN.	Acres.	Type of Land.	Variety planted.
Templeton,	50	Cut-over,	White pine, Norway spruce.
Heath,	80	Run-out pasture,	White pine.
Hopkinton,	28	Sprout land,	White pine, Norway spruce.
Buckland,	11	Cut-over,	White pine.
Hopkinton,	80	Cut-over,	White pine, Norway spruce.
Norwell,	10	Cut-over; pasture,	White pine.

State Plantations, 1912 — *Concluded.*

Town.	Acres.	Type of Land.	Variety planted.
Ashburnham,	28	Pasture,	White pine.
Barre,	38	Cut-over,	White pine.
Dover,	13½	Cut-over,	White pine.
Oakham,	80	Cut-over,	White pine.
Becket,	10	Pasture; mowing,	White pine.
Duxbury,	38½	Cut-over,	White pine.
Warwick,	28	Cut-over,	White pine.
Wellfleet,	6½	Cut-over; sandy,	Scotch pine.
Ashburnham,	70	Old pasture,	White pine.
Paxton,	50	Cut-over,	White pine.
Greenfield,	4	Old field,	White pine.
East Brookfield,	30	Cut-over,	White pine.
Hubbardston,	15	Cut-over,	White pine.
Belchertown,	6	Old pasture,	White pine.
Shirley,	18	Cut-over,	White pine.
Shirley,	10	Old pasture,	White pine.
Hubbardston,	12	Cut-over; plain,	White pine.
Lancaster,	40	Cut-over; plain,	White pine.
Ashburnham,	19	Old field,	White pine.
Ashburnham,	6	Old field,	White pine.
Ashburnham,	4	Old field,	White pine.
Dennis,	20	Cut-over sprout,	White pine, Austrian and Scotch.
Spencer,	5	Cut-over,	White pine.

Proposed Plan for doing Forestry Work on State Reservations and on State Lands.

There are many State institutions and reservations that have areas of land that should be placed under better systems of forestry management, either by proper thinning or reforesting. The State Forester is in a position to assist these institutions in the future by offering them young trees from his nurseries free of charge. He also will be at their service in outlining systems of forestry management and in assisting in other ways in establishing a definite forest policy. Surely those in charge should be able to find some source whereby the manual labor expenses could be met. In consulting with the Greylock Reservation Commission, for example, we find that they are under considerable outlay in

maintaining roads, and the general expenses are as much as they are able to finance. With an acreage of 8,000 acres, some of which is wooded and a large percentage of it capable of being reforested, it would seem that the State is derelict in its duty in not setting the private land-owner a good example by practicing upon its own land the principles of forestry management. What is true of Greylock is more or less true of other reservations and lands owned by the State at various institutions.

As a means of getting some real active forestry work started on these lands the State Forester might be given a small yearly appropriation for doing work of this sort in co-operation with the various boards. Should this be done it is suggested that the receipts from this work thereafter should be turned over to the State through the State Treasurer. Were we to spend $5,000 a year simply for manual labor in thinning existing growth or setting out young trees, it will be seen that the expenditure would go very far toward getting done just what is necessary.

Forest Taxation.

It has long been known to the observant that the present unjust method of taxing forest lands has constituted one of the most formidable obstacles to the development of forestry in this State. Under the present law all property, both real and personal, is subject to taxation to provide the revenue necessary to defray the running expenses of municipal, State and national government. This law applies to forest lands the same as to other kinds of property, and requires an annual assessment of taxes based upon the true value of the land, together with the trees growing thereon. The evil of this common practice has been made painfully apparent by the action of the owners of such property, who to escape this burdensome tax seek relief by cutting and marketing the trees while very immature, and long before they have attained their highest commercial value. The question of taxation has also served to retard the progress of the reforestation movement, the importance of which to the economic welfare of the State is of such magnitude as to fairly entitle it to any reasonable concession, of whatever nature, which may have a tendency to encourage and foster it. By the authority given it by the amendment to the Constitution adopted by the voters

The State Forester's nursery at Amherst, taken in July.

A Scotch pine plantation on the estate of Mr. Charles Francis Adams in Lincoln, Mass.

at the last State election, the General Court of 1913 will undertake the rather difficult task of solving the forest taxation problem by legislation.

So intricate is the subject, and so vital is it that proposed legislation along this line should be thoroughly well considered, that the Boston Chamber of Commerce has joined with the Massachusetts Forestry Association in the appointment of a committee to study the problem and to prepare a bill designed to eliminate many of the objectionable features of the present method of taxing these lands. It is difficult to determine, or even forecast at this time, in just what form this bill will be presented to the Legislature for its consideration.

That which is needed is such changes in the present method as will encourage tree planting and the conservation of forests without relieving the forest owner of his responsibility of giving his just share toward the support of government. If this taxation problem is successfully worked out, a long step will have been taken in the right direction, and forestry will eventually become one of the leading factors in contributing to the wealth and prosperity of the State.

Present Conditions regarding the Chestnut Bark Disease in Massachusetts.

While the whole forestry staff has been on the lookout for this disease throughout the year, nevertheless it was deemed best to have a general inspection of the State made, and Mr. John Murdoch, Jr. was delegated to do this. He visited the worst infected sections that he was familiar with from his work of last year, and submitted the following report: —

In southern Berkshire County the disease, as has already been reported, is almost universally distributed. A number of cases were found which had not previously been reported, either from having been overlooked under the conditions of observation last winter, or in territory not then covered. A number of cases also were discovered which had first become evident during the past summer, amounting in all to perhaps 100 per cent. increase. Careful examination of many cases, however, led to the conclusion that most of the apparent increase was due to lesions which had started in 1911, but which had not killed the host until 1912. On trees

which were previously infected, the disease seems to have made comparatively little headway during the past season. Even at the locality in Alford which was reported as the worst seen in the State last year, and which still maintains that reputation, no new trees seemed to have died, and the disease had increased but little. A few new lesions were observed in some places throughout the county, principally on small twigs, including one apparently on the new growth of the year.

A former employee of the Pennsylvania Blight Commission says that the infection in this region is more general than he has seen it even in eastern Pennsylvania and New Jersey. In these States the diseased trees occur in more or less widely separated groups, while here they are commonly uniformly distributed throughout the stand.

In Wilbraham and Hampden, Hampden County, the disease is as widely distributed as in Berkshire County, and the increase for 1912 is apparently no greater. On one tract of sprout growth observed by Mr. Robert I. Edson, forest warden of Wilbraham, on which every tree is attacked, the disease has made very little headway the past year. Mr. Edson is the man who first called the attention of this office to the presence of the disease in Massachusetts.

Lumbermen in Hampshire County say that the disease has made a great spread there. It seems probable, however, that this is due rather to better recognition of the disease than to an actual increase.

In southeastern Worcester County very little fresh work was seen. In particular, one of the group of sprouts in the town of Douglas, photographed in January, 1912, which at that time had a fair-sized canker on the trunk, was on October 3 still green in the top. The canker was larger but had not spread completely around the trunk, although this was only four inches in diameter. The larger tree, photographed the same day, had lost only one additional branch.

All over the State, with the possible exception of Hampshire County, as noted above, the disease seems to have made much less headway than was to have been expected from its previous rate of spread.

It is reported that experimental inoculations in Pennsylvania

show that the disease develops more rapidly in the valleys than towards the top of the ridges. Mr. Edson states that he has observed the disease growing much more rapidly in trees on the edge of a fertilized field than in trees on a rocky knoll near by.

Successful inoculations are said to have been made on a number of other trees besides chestnut, including oak, — species not given, — tulip-poplar, and sumach, though there are no reports of natural infection on these trees.

A recent writer in "Phytopathology" states that he has determined the fungus known in Europe as *Endothis radicalis* to be identical with the so-called *Diaporthe parasitica* of America. This fungus, although long known, has never been reported as producing any disease in Europe. This article is simply a confirmation of the identification made some time ago by Dr. W. G. Farlow. It is said that inoculations with the European fungus on American chestnuts have produced the disease.

It has been discovered that, under favorable conditions, the ascospores — the "winter spores" of the publications — may be shot to a distance of several centimeters from the surface. They may then be taken up by the wind and carried to an indefinite distance. The possibility of spreading by the wind was suggested in the pamphlet published by this office last spring. The spores are covered with the sticky contents of the ascus, and adhere firmly to whatever they strike. It is impossible to blow them from a plate of glass even, and very difficult to wash them off with a stream of water.

The phenomenon shown in Figure 1 of the above pamphlet is probably not the early stage of the disease, as there stated. It is undoubtedly caused by an insect called the "Chestnut Bast Miner," the larva of which was only recently discovered. The adult is as yet unknown. The galleries of this insect do, however, form a very common point of attack for the disease.

The Bureau of Entomology has recently announced the discovery of five species of insects which feed on the pustules of the bark disease fungus, and by thus destroying the spores check its spread to a greater or less extent.

Record has been made of all known stations of the disease in this State on a set of maps kept for that purpose.

Danger from Slash.

It is thought best to call attention again to the great forest fire losses occurring yearly from the slash following logging operations. In a State like Massachusetts, where during the summer season our population is spread throughout the country, the chances for forest fires are very great. When fires get established in these slash areas they present a very perplexing problem and often get under such momentum that great areas are destroyed before the fire is brought under control.

The State Forester believes that if the local forest wardens were given authority to consult with the lumbermen before the operation was begun, with a view of leaving some simple fire lines for future protection of adjoining properties, much good could be accomplished. This whole question is one of education. Up to the present little attention has been given the subject, and it is not uncommon to see the brush piled upon the line fence of the abutter, or even into the highway along country back roads. A wide-awake forest warden with a little authority could quickly get the co-operation of his people, and this would greatly lessen the present dangers. The ideal method of disposing of slash is to pile and burn it at once, but this is thought too expensive by many. The next thing is to spread the brush out thinly, so that it will quickly decay, and cut it up with belts or fire lines free of slash, so that should any portion catch fire it could be held within small areas.

Report of the State Fire Warden.

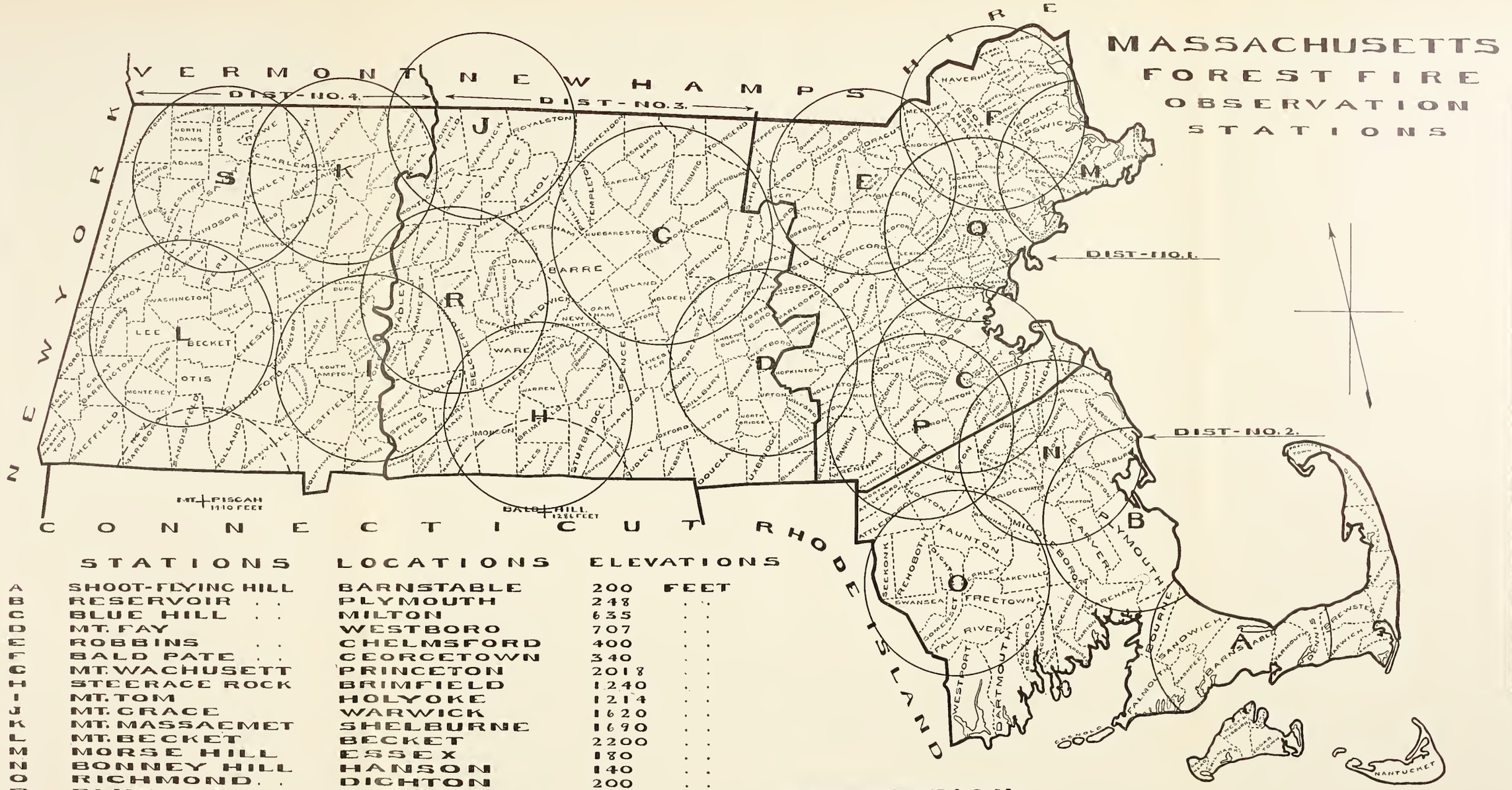
Mr. F. W. Rane, *State Forester.*

Sir: — In compliance with your request I beg to submit the following report of the work accomplished by this branch of the department during the present year: —

The State has been divided into four forest fire districts, each district being in charge of an experienced and competent district forest warden, the district arrangement being as follows: District No. 1, Essex, Middlesex and Norfolk counties; District No. 2, Barnstable, Bristol and Plymouth counties; District No. 3, Worcester County and west to the Connecticut River; District No. 4, Berkshire County and east to the Connecticut River.

The principal work of the district forest wardens has been constructing telephone lines, erecting steel observation towers, map making, inspecting all forest fire-fighting equipment, visiting selectmen and forest wardens,

MASSACHUSETTS FOREST FIRE OBSERVATION STATIONS



		STATIONS	LOCATIONS	ELEVATIONS	
✱	A	SHOOT-FLYING HILL	BARNSTABLE	200	FEET
✱	B	RESERVOIR . .	PLYMOUTH	248	. .
✱	C	BLUE HILL . .	MILTON	635	. .
✱	D	MT. FAY	WESTBORO	707	. .
✱	E	ROBBINS . .	CHELMSFORD	400	. .
✱	F	BALD PATE . .	GEORGETOWN	340	. .
✱	G	MT. WACHUSETT	PRINCETON	2018	. .
✱	H	STEERAGE ROCK	BRIMFIELD	1240	. .
✱	I	MT. TOM	HOLYOKE	1214	. .
✱	J	MT. GRACE	WARWICK	1620	. .
✱	K	MT. MASSAEMET	SHELBURNE	1690	. .
✱	L	MT. BECKET	BECKET	2200	. .
+	M	MORSE HILL	ESSEX	180	. .
+	N	BONNEY HILL	HANSON	140	. .
✱	O	RICHMOND . .	DICHTON	200	. .
+	P	BLUFF HEAD	SHARON	440	. .
+	Q	HART HILL	WAKEFIELD	240	. .
✱	R	MT. LINCOLN	PELHAM	1240	. .
+	S	MT. TOWER	SAVOY	2560	. .

EXPLANATION

✱ OBSERVATION STATIONS IN OPERATION IN 1911 - 1912.

\+ NEW STATIONS PROPOSED FOR 1913.

MT. PISCAH AND BALD HILL ARE CONNECTICUT CO-OPERATIVE STATIONS.

(L) RADIUS RANGE OF STATIONS IS 12 AND 13 MILES.

SCALE

STATE FORESTERS OFFICE 1913

and showing them the importance of appointing deputy forest wardens and having them distributed advantageously in the outlying timbered districts of the towns. This work has been very satisfactory, enabling us to have a large number of deputies appointed, which adds materially to the efficiency of the fire-fighting force of the department. In visiting the different towns our district forest wardens have taken especial pains to urge upon the selectmen and forest wardens the necessity of purchasing ample forest fire-fighting equipment. Each district forest warden has under his personal supervision practically 1,250,000 acres, 70 per cent. of which is forested or denuded lands. He also has supervision over the observation stations lying within his district.

We have had in operation this year 17 observation stations, each station covering practically 300,000 acres. They were placed in operation May 1 and were discontinued November 10.

District No. 1. — We have had in this district four observation stations. Blue Hill observatory at Milton covers the Blue Hill Reservation and a large area of adjoining forest land. Robbins Hill station in the town of Chelmsford covers a portion of the watersheds of the Concord and Merrimac rivers. At this station we erected a 30-foot steel tower with a 7-foot square room at the top. We also have a station at Bald Pate Hill, Georgetown, covering a portion of the North Shore and valuable forest land adjoining. At this station we erected a 30-foot steel tower with a 12-foot room at the top. The owner of Bald Pate Hill contributed one-half toward the purchase price and erection of the tower. We also have a station at Bluff Hill in the town of Sharon, covering the forest area to the Rhode Island line. At this station we have erected a 30-foot steel tower with an 8-foot square room at the top. We have established a temporary station at Wakefield on Castle Rock. This is used during dry and hazy weather, and has been under the supervision of the fire department of Wakefield. Negotiations are now being made to erect a steel tower on Hart Hill in Wakefield, one-half of the expenses to be borne by the town of Wakefield. This station will undoubtedly be established the coming year. Arrangements have been completed for the location of an observation station on Morse Hill on the Manchester and Essex line; a 40-foot tower will be erected and a telephone line completed in readiness for the spring work. This station will protect the valuable North Shore property. It is also necessary to establish a station on Nobscot Hill in the town of Framingham, to cover a large tract of territory that we are unable to reach from other stations. With these additional stations, to be established as substations, we shall be able to completely overlook all of District No. 1.

District No. 2. — In this district we have three stations in operation, — Reservoir Hill in Plymouth, Shoot Flying Hill in Barnstable and Richmond Hill in Dighton. At Plymouth we have had the use of the Plymouth observation tower, from which we have been able to cover the towns of Plymouth and Kingston, but I find that a station located on

Monks Hill in Kingston, which is one of the highest elevations in Plymouth County, would not only cover the territory now reached from the Plymouth tower, but would also cover a large tract west and south that we are unable to reach from Plymouth. It seems, therefore, advisable that this station be changed to Monks Hill, thus giving full protection to all the surrounding territory. At Richmond Hill we have been obliged to erect a 30-foot tower with an 8-foot room at the top. At Shoot Flying Hill we have added 10 feet to the tower that was already there, making an enclosed room for the observer. This station covers a large part of the Cape forest area. It will be necessary to establish a substation at Bourne and also one in the vicinity of Bridgewater or Hanson. These two stations, covering a territory that we are unable to reach from the stations now in operation, will practically complete the system in District No. 2.

District No. 3. — We have had five stations in operation in this district: Wachusett at Princeton, Fay Mountain at Westborough, Steerage Rock Mountain at Brimfield, Grace Mountain at Warwick and Lighthouse Hill at Prescott. This last-named station will be discontinued and a new station will probably be established on Lincoln Mountain in the town of Pelham, which will better protect this territory. Steel towers have been erected at Fay Mountain and at Steerage Rock Mountain this year. It will be necessary to establish two or three substations in this district to be used the coming year. The watersheds of the Blackstone, Chicopee, Miller, Nashua, Thames, Connecticut, Deerfield and Miller rivers are protected from these stations.

District No. 4. — In this district we have had four stations in operation. Mount Tom at Holyoke, where we have been allowed the use of the observation room at the Summit House, is an exceptionally good station, as we have the use of eighteen powerful telescopes. It will be necessary to install a private telephone line for use at this station the coming year. On Massaemet Mountain at Shelburne Falls we have been allowed the use of the 63-foot stone tower, and have enclosed the top with a 12-foot octagon building. We have had an observer on Greylock Mountain during a portion of the season, but owing to the high elevation of this station the results are far from satisfactory. We are not only unable to cover the Greylock Reservation, but we are also unable to cover the large area of forest land surrounding this range. I think it will be necessary, in order to cover this territory, to establish two stations, one on Tower Mountain, in the town of Savoy, which has an elevation of 2,500 feet and a second on a high point in the town of Williamstown, or, possibly, on Berlin Mountain, just over the New York line. In case a station is established on this last-named mountain it will be necessary that some co-operative agreement be made between the States of New York, Vermont and Massachusetts relative to the installation and maintenance of the same, as such a station will cover a large forest area in these two adjoining States. We have also had in operation a station on Becket Mountain in the town of Becket. Here it has been necessary to install a tele-

phone line and to erect a 30-foot steel tower with an enclosed room at the top. It will be necessary to establish two or three more substations in this district in order to properly protect the forest area and the watersheds of the Connecticut, Deerfield and Miller rivers. One of these stations will be located on October Mountain, covering the Whitney Preserve and the Pittsfield watershed.

The results obtained from the observation stations have been very satisfactory. While it has been absolutely impossible to detect every smoke, owing to the hazy and cloudy weather, at times making it impossible to see over 8 or 10 miles (although the observer is supposed to cover a radius of at least 15 miles), yet it is very gratifying to report that out of 1,800 fires reported by the different forest wardens over 1,500 were first observed by the men in charge of the observation stations. Of the fires reported by these observers our tables show that 51 per cent. were extinguished within one hour from the time they were observed, 21 per cent. within two hours, 15 per cent. within three hours, 5 per cent. within four hours, 3 per cent. within five hours, and that but 5 per cent. burned over five hours.

It seems necessary that there be established throughout the State more substations, to be used only during dry and hazy weather, when it is absolutely impossible to protect the territory by the permanent stations.

The triangulation system which was adopted this year has proved very effective in locating fires accurately at a distance of 12 or 15 miles. I feel confident that arrangements will be made the coming season for extending this system into the States of New Hampshire, Vermont and Connecticut, thus enabling us to get readings from their observation stations bordering on the north and south of this Commonwealth.

The towers with which we are equipping our stations are constructed for permanent use, being made of heavy steel, from 30 to 40 feet high. They are constructed with an 8 by 8 foot square building at the top, which has a glass enclosure as far as possible, thus allowing the observers to be continually on the watch and protecting them from inclement weather, as well as providing a suitable protection for our maps, report blanks, telephone and all necessary equipment. These towers cost complete, all constructed on cement piers, from $225 to $275, the variation in price being on account of difference in locality and expense of hauling. All construction work is done entirely by our district forest wardens and observation men, and I desire to say that we are extremely fortunate in having as district forest wardens men who are capable of handling this line of work as well as all map making and telephone construction work.

Forest Fire Equipment.

Under an act of the Legislature passed in the spring of 1910, appropriating $5,000 annually for forest fire prevention, all towns with a valuation of $1,500,000 or less are entitled to 50 per cent. reimbursement on all forest fire-fighting equipment they desire to purchase, not exceeding $500,

no town being allowed an amount exceeding $250. This equipment must be approved by the State Forester and placed under the supervision of the town forest warden subject to inspection at least once a month by the State Fire Warden or his duly authorized assistants. There are 172 towns in the Commonwealth which come within the provisions of this act, and owing to the fund not having been exhausted in the two previous years, a special effort was made early this season to interest towns in the necessity of taking advantage of the act, thereby better providing themselves with suitable equipment. The results have proved very satisfactory. Over 60 towns have filed their applications for reimbursement. The appropriation not being sufficient, but 45 towns were reimbursed, to the amount of $4,989.99. This exhausted the appropriation, and made it necessary to carry the balance of nearly $2,000 due other towns over to another year.

In selecting equipment several towns have purchased forest fire wagons complete with extinguishers and Marshfield cans, while other towns, not as favorably situated, have purchased a large number of extinguishers, distributing them among their deputies in the rural and timbered districts, each deputy being supplied with at least five extinguishers with necessary charges and water cans. This department holds receipts from the forest wardens for all equipment purchased under the reimbursement act.

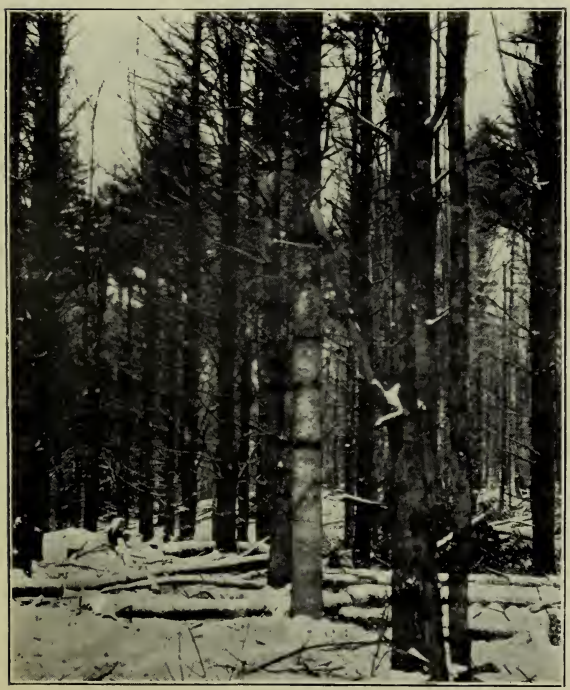
There are 182 towns, with a valuation exceeding $1,500,000, which are not entitled to reimbursement. These towns are obliged to assume the total expense for whatever equipment they deem necessary. Several of them, seeing the necessity of improving their equipment, have purchased forest fire wagons and extinguishers, while other towns have purchased 30-horse power and 40-horse power motor trucks fully equipped for handling forest fires. Besides carrying the necessary equipment they are also able to carry from 20 to 30 men and make from 30 to 40 miles per hour. The towns of Plymouth, Hopedale, Winchendon, Rutland and Dover have purchased such trucks during the past year.

Our reports show the total amount expended for forest fire equipment this year throughout the Commonwealth to be $23,389.88. The following tables show, first, an itemized statement of the equipment purchased during the years 1910, 1911 and 1912 under the reimbursement act, and the amount received by each town from the Commonwealth during that period; second, a list of the towns having purchased equipment *this year*, and the amount of reimbursement received by them.

Railroad Fires.

I am pleased to report many improved conditions in the railroad fire situation. While there is no law in this State permitting inspection of locomotives by this department, through the courtesy of Mr. W. L. Larry, inspector for the Board of Railroad Commissioners, I accompanied him on several inspection trips covering a number of Boston & Albany, Boston & Maine, and New York, New Haven & Hartford locomotives. The

Forest fire observation tower, on Moose hill, Sharon.



Stevens Estate, Warwick (stand after thinning; logs on the ground).

conditions were practically the same on the different roads. Special attention had been given to the screens in the front ends, and they were found to be in exceptionally good condition, although instances were found where defective screens were in use. The chief cause of a large percentage of railroad fires seemed to be in not using necessary precaution in screening the ash pans and grates, and in allowing locomotives to operate with ash-pan slides open. Recommendations were made by the Board of Railroad Commissioners that rounded extensions or perforated plate or netting be used to close the opening between the mud ring and the top of the ash pan in the wide fire-box locomotives, and that in the flat type of ash pans perforated plate or netting be placed over the ends of ash pans, and that these nettings be securely hooked, and all openings for grate shaker levers be protected so that no fire could escape from the ash pans or grates. These improvements required several days' work on each locomotive. A report received from the Boston & Albany Railroad under date of Nov. 4, 1912, shows that they have in this State a main line mileage of 337 miles, and have in operation 356 locomotives, of which 300 have been repaired to comply with the requirements of the commission; 34 which do not comply with the requirements of the commission are still in operation, and 22 are in the shop and will be repaired before going into service. The necessary changes on the 34 above mentioned will be made during the winter.

Undoubtedly more work has been accomplished by the Boston & Maine than by any other road, when we take into consideration that they have a main line mileage of 1,200 miles and 800 locomotives in operation within this State. Owing to their loss by railroad fires last year exceeding $200,000, a department of fire claims and fire prevention was established early in March under the supervision of Mr. E. A. Ryder, and through his efforts their fire loss in this State does not exceed $15,000 this year. In July an appropriation of $30,000 was made for equipping their locomotives with an improved ash pan, and for screening the space above the mud ring. Up to the present time 255 locomotives have been placed in condition, and during the coming year a large percentage of the balance will receive the necessary repairs.

All inflammable material within their right of way has been removed or burned at different times throughout the season. Dangerous places adjoining their right of way have been cleared of slash and necessary fire lines have been built. A trench three feet wide is made around each pile of ties before burning.

Special effort has been made to better train their engineers in the handling of their locomotives, endeavoring to do away with the "slipping" of engines, which has a tendency to churn the fire and cause sparks to be emitted from the stack.

The officials of this road have placed in all smoking, baggage, express, mail and caboose cars signs reading: "Save the forests. Do not throw lighted matches, cigars or cigarettes from the cars." These signs should

be placed in all cars of such nature, and in all electric cars running through forest lands throughout the State.

We experienced considerable trouble early in the season with the Central Vermont Railroad, and an inspection of their locomotives was made, with the result that nearly all of them were found in some way defective. As they had but 29 locomotives in operation throughout the Commonwealth, these were repaired and placed in very good condition within thirty days, and we experienced very little trouble with them during the remainder of the season.

Up to the present time I have been unable to procure a detailed statement from the New York, New Haven & Hartford Railroad giving a summary of what they have done in the matter of fire prevention. I understand, however, that they have 781 locomotives in operation in this State, 60 of which have been equipped with what is called the "Talmage" ash pan, which absolutely prevents the escape of coals from this source. The balance of their locomotives are being equipped at the rate of 60 each month, so that by another season a large percentage of their locomotives should be in excellent condition. The results obtained by the New York, New Haven & Hartford have not been entirely satisfactory, and I think this can be attributed to two reasons: first, it has taken considerable time to perfect an ash pan suitable for their type of locomotives, thus allowing the use of their locomotives all summer with the old ash pans; second, they still hold to their old policy of preferring to settle fire claims rather than to devote more time to ascertaining the causes of their fires and then applying preventive methods. Much better results will be obtained from this road another year.

Our railroad fire reports show that we have had 640 railroad fires, as follows: New York, New Haven & Hartford, 353; Boston & Albany, 117; Boston & Maine, 146; Central Vermont, 24; burning over an area of 5,771 acres, with a cost to extinguish of $5,530 and a damage of $27,955. During the year 1911 we had 685 railroad fires, burning over 29,842 acres and causing a damage of $330,389.50. A comparison shows that, while we had nearly as many fires this year from this source, owing to the efficient work done by the railroad officials, together with the assistance derived from our observation stations and town forest wardens, the fires were extinguished without causing the serious losses of previous years.

Railroad officials claim that an inspection is made once a week of the screens in the front ends of all locomotives operating in this State, and that once a day the ash pans and grate protections are examined, showing that at the time any locomotive leaves the roundhouse or yard it is in perfect condition.

A large number of dangerous railroad fires would be prevented if property owners whose lands adjoin a railroad's right of way would devote a little time and money to removing or burning the inflammable material within 50 or 100 feet of the right of way. The same condition arises along highways running parallel with railroads and within a few feet of them when brush is allowed to accumulate.

Rural Mail Carriers.

The Postmaster-General, under date of May 31, 1912, issued an order requiring all rural mail carriers to promptly report all forest and brush fires to the nearest forest warden or deputy forest warden. We have within the Commonwealth of Massachusetts 300 rural and star route carriers, with routes averaging about 20 miles, thus giving us a patrol route of practically 6,000 miles that is traveled each day, with the exception of Sundays and national holidays. As soon as the above order became effective each carrier was supplied with a list of wardens and deputies, together with their telephone numbers and places of residence, in order that all fires observed by them could be promptly reported and extinguished.

An investigation shows that, owing to this branch of the work being entirely new, there are a large number of routes with no forest wardens or deputies residing on them; therefore it is necessary that our district wardens, in connection with the different town forest wardens, go over each route and have necessary deputies appointed residing in or near the forest areas and dangerous fire localities and having telephone connection. This work I believe will be completed during the coming winter in order that we may be in readiness for spring fires. The work accomplished by the carriers this season has been very effective. Our reports show 84 fires observed and reported, besides several fires extinguished in their incipiency by the carriers.

Federal Co-operation.

The Weeks bill, passed in 1910, providing for the purchase of portions of the White Mountain and Appalachian Mountain regions, to be held as government reservations, also carried an appropriation of $200,000 for the protection against forest fires of the watersheds of navigable streams in the United States. Of this appropriation $2,500 was allotted to the State of Massachusetts, to be expended in co-operative effort in such sections of the Commonwealth as would properly come within the provisions of the bill. This restricted our co-operative work to the western portion of the State, including the watersheds of the Nashua, Chicopee, Miller, Thames, Blackstone, Hudson, Connecticut and Deerfield rivers. This allotment became available May 1, and was used for the payment of federal observation men who were placed in charge of the 9 observation stations west of the east line of Worcester County, this being the territory coming within the co-operative agreement. Of the amount appropriated, $2,477 was expended in this work. Owing to the State appropriation not being sufficient to carry on the work mapped out throughout the State, this government aid has been very necessary, permitting us to expend a portion of our State allotment in the construction of observation stations and telephone lines, as under the terms of the agreement with the United States government the State is required to expend an amount equal to that expended by the federal authorities in protecting the above-

named territory. Owing to its being necessary to establish more observation stations within this territory in order to better protect the watersheds of these rivers, it is necessary that our federal appropriation be increased to at least $3,500 for the coming year.

Boy Scouts.

We have within the Commonwealth of Massachusetts 7,000 boy scouts. These are divided into 250 separate companies, each company being in charge of a scout master or assistant scout master. As soon as the fire season started in the spring we supplied each scout master and assistant with a copy of the fire law and instruction book, thus enabling them to instruct the members of the different companies relative to the forest laws.

The reports received do not show that the boy scouts have been instrumental in causing a single fire, but do show that they have extinguished several brush fires and have patrolled the railroad right of way in different localities, extinguishing fires, and it is but fair to assume that the educational work done through the scout masters has resulted in the prevention of many fires. When necessary to have camp fires they have always complied with the law by applying to the town forest warden for the necessary permit, the same being granted when weather conditions were favorable.

Prosecutions and Convictions.

Under section 2, chapter 244 of the Acts of 1911 every forest warden or deputy forest warden is vested with authority to arrest, without a warrant any person in the act of setting or maintaining a fire in violation of the law. To the average person this may seem a very easy matter, but owing to the fact that a party must be caught in the act of setting or maintaining a fire in order to arrest and take him before a magistrate having jurisdiction in such cases, it is possible to get but a small percentage of the violators. Reports show that 16 parties have been convicted for violating the fire law during the season; also that several parties have been allowed to settle by paying to the selectmen an amount equal to the cost of extinguishment. Owing to the permit law which governs all forest or brush fires, having been in operation but two years, I have not been in favor of enforcing the law too severely by recommending arrest in every instance of violation, but have endeavored, in cases where parties were unfamiliar with the laws and had violated them unknowingly, to arrive at some satisfactory settlement.

Deputy Fish and Game Commissioners.

It is gratifying to report the efficient forest fire work accomplished by the deputy fish and game commissioners of the State. While their duties are confined, in general, to the protection of the fish and game, section 299 of the Acts of 1907 also gives them authority to arrest without warrant any person found in the act of unlawfully setting a fire, and under section 20, Revised Laws, they have power to summon necessary assist-

ance to extinguish fires, which gives them the same powers and duties as are vested in a town forest warden except that they do not have authority to issue permits. They were supplied with copies of the forest fire laws early in the season, and their names were placed on our observation list, together with their addresses and telephone numbers. The observers were instructed to call them only when necessary. The reports received at this office show that they have been instrumental in extinguishing nearly 100 fires. I believe that in future years marked results will be shown by the co-operation with the fish and game deputies during severe droughts.

Precipitation, in Inches, for the Years 1910, 1911 and 1912, with December of Previous Year.

Months.	1910.	1911.	1912.	Normal.
December,	3.80	3.24	2.59	3.74
January,	4.89	3.07	3.87	4.12
February,	4.03	3.20	2.24	3.97
March,	1.77	3.27	5.26	4.34
April,	2.64	2.86	4.05	3.46
May,	1.60	0.89	4.03	3.37
June,	3.97	4.76	0.53	3.07
July,	2.41	4.55	4.16	3.65
August,	1.05	6.70	3.85	3.70
September,	2.29	3.36	1.71	4.36
October,	1.64	3.01	1.52	4.13
November,	5.39	5.71	3.45	3.96
Totals,	35.48	44.62	37.26	45.87

Table showing Percentage of Fires occurring at Different Hours of the Day.

Time.	Per Cent.	Time.	Per Cent.
7 to 8 A.M.,	1.0	1 to 2 P.M.,	16.0
8 to 9 A.M.,	3.0	2 to 3 P.M.,	14.5
9 to 10 A.M.,	9.0	3 to 4 P.M.,	10.0
10 to 11 A.M.,	8.0	4 to 5 P.M.,	9.0
11 to 12 M.,	13.0	5 to 6 P.M.,	7.0
12 to 1 P.M.,	7.0	6 to 7 P.M.,	2.0

Comparative Damages by Forest Fires for the Past Five Years.

Year.	Number of Fires.	Acreage burned.	Cost to extinguish.	Damage.	Average Acreage per Fire.	Average Damage per Fire.
1908,	1,289	39,672	–	$205,152	30.78	$159 15
1909,	1,496	35,083	–	189,482	23.45	126 66
1910,	1,385	42,221	$23,475	205,383	30.46	148 29
1911,	2,536	99,693	47,093	537,749	39.31	226 24
1912,	1,851	22,072	20,219	80,834	11.92	43 67

Forest Fires of 1912.

Months.	Acres.	Damage.	Cost to extinguish.	Number.
1911.				
December,	97	$42	$134	55
1912.				
January,	20	435	476	33
February,	5	–	7	20
March,	428	777	360	117
April,	4,756	8,884	2,223	408
May,	3,556	16,800	2,636	318
June,	1,797	12,108	2,167	181
July,	2,748	10,772	4,616	258
August,	123	444	174	28
September,	85	150	86	15
October,	7,835	28,387	6,806	358
November,	622	2,035	527	60
Totals,	22,072	$80,834	$20,212	1,851

Comparative Causes of Forest Fires for the Past Three Years.

Causes.	1910.		1911.		1912.	
	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.
Unknown,	413	32.9	1,128	44.5	649	35.1
Railroad,	362	28.8	685	27.0	640	34.6
Burning brush,	203	16.2	135	5.3	93	5.0
Smokers, hunters, berry pickers,	124	9.9	158	6.2	223	12.0
Steam sawmills,	1	.1	3	.1	8	.4
Children,	75	5.9	118	4.7	79	4.3
Miscellaneous,	78	6.2	309	12.2	159	8.6
Too late for tabulation,	129	–	–	–	–	–
Totals,	1,385	100.0	2,536	100.0	1,851	100.0

Inventory of Equipment purchased under the Reimbursement Act.

Town.	Axes.	Cans.	Extings.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wagons.	Reimbursement.
Acushnet,	1	10	116	–	–	–	4	1	–	–	1[1]	$143 22
Ashby,	–	–	12	–	–	–	–	–	–	–	–	34 50
Ashland,	–	–	6	–	–	–	12	6	–	6	–	43 27
Auburn,	–	–	70	–	–	–	–	–	–	–	–	210 00
Avon,	–	10	–	–	–	–	12	–	–	–	–	9 90
Bedford,	1	14	24	–	–	–	–	–	–	–	1[2]	249 67
Belchertown,	–	–	6	–	–	–	–	–	–	–	1	71 62
Bellingham,	–	10	20	–	–	–	–	–	–	6	–	67 22
Berkley,	–	–	14	–	–	–	–	–	–	–	–	144 00
Berlin,	2	10	38	–	–	1	12	–	3	12	1[1]	241 45
Blandford,	–	1	16	–	–	–	–	–	–	–	–	59 80
Bolton,	–	14	12	–	–	–	6	–	–	6	–	58 40
Boxborough,	–	–	30	–	–	–	–	–	–	–	–	90 00
Boxford,	–	–	16	–	–	–	–	–	–	–	–	45 60
Boylston,	–	–	24	–	–	–	–	–	–	–	–	76 20
Brimfield,	–	10	30	–	–	–	–	–	–	–	–	99 75
Carlisle,	2	15	10	–	2	–	6	–	1	6	1[1]	193 72
Charlton,	–	–	68	–	–	–	40	–	–	60	–	221 37
Chatham,	2	15	10	–	2	3	4	–	3	5	1[1]	152 98
Dighton,	2	8	18	–	1	–	–	–	2	2	1[1]	108 67
Douglas,	–	25	50	–	–	–	–	–	–	–	–	175 00
Erving,	–	–	25	30	–	–	–	–	–	18	–	86 52
Freetown,	–	24	8	–	–	–	2	–	–	48	–	87 62
Georgetown,	–	20	24	–	–	–	–	–	6	12	–	98 83
Gill,	–	5	20	–	–	–	–	–	–	–	–	65 00
Greenwich,	–	–	18	–	–	–	–	–	–	–	–	60 45
Groveland,	–	6	12	–	–	–	–	–	3	12	–	51 05
Hadley,	–	–	15	–	–	–	–	–	–	–	–	75 00
Halifax,	–	12	52	–	–	–	12	–	–	18	–	205 91
Hanson,	–	6	24	–	6	–	6	–	–	5	1[3]	250 00
Harvard,	2	7	14	–	2	3	–	–	3	12	–	201 52
Holbrook,	–	12	10	–	–	–	–	–	–	–	–	69 00
Lunenburg,	2	12	10	–	2	3	4	–	3	5	1[1]	149 28
Lynnfield,	–	10	20	–	–	–	–	10	–	–	2[2]	246 25
Mashpee,	–	–	8	–	–	–	–	–	–	12	–	34 55

[1] One-horse. [2] Two-horse. [3] Motor Truck.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT ACT — *Continued.*

TOWN.	Axes.	Cans.	Extings.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wagons.	Reimbursement.
Merrimac,	–	–	15	–	–	–	–	–	–	–	–	$75 00
Middleton,	–	–	16	–	–	–	–	–	–	–	–	49 50
New Braintree,	–	–	25	–	–	–	–	–	–	–	–	76 87
Newbury,	–	–	6	–	–	–	–	–	–	–	–	18 15
North Reading,	–	–	–	–	–	–	–	–	–	–	1[1]	134 43
Northborough,	–	–	25	–	–	–	–	–	–	–	–	102 37
Norwell,	–	–	32	–	–	–	12	–	–	–	1[1]	243 87
Oakham,	–	–	24	–	–	–	–	–	–	–	–	138 00
Pelham,	–	–	19	–	–	–	–	2	–	–	–	76 62
Pembroke,	–	–	24	–	–	–	–	–	–	–	1[2]	203 75
Petersham,	2	10	22	–	2	3	4	–	3	5	1[1]	202 55
Phillipston,	–	6	14	–	–	–	–	–	–	–	–	48 65
Plainville,	2	10	10	–	2	3	4	–	3	5	1[1]	178 50
Prescott,	–	–	10	–	–	–	–	–	–	–	–	48 16
Princeton,	–	32	80	–	–	–	–	–	–	–	–	249 20
Raynham,	3	46	30	–	6	–	12	–	9	15	3[1]	222 23
Rehoboth,	–	10	48	–	–	–	–	–	–	–	1[1]	250 00
Richmond,	–	15	15	–	–	–	4	–	–	–	–	56 20
Royalston,	3	10	15	30	2	2	12	–	–	30	1[1]	120 60
Rutland,	–	12	18	–	–	–	6	–	–	–	1[2]	250 00
Sandwich,	22	12	36	–	–	2	–	–	–	24	1[1]	245 60
Shelburne,	–	–	50	–	–	–	–	–	12	6	1[1]	186 87
Shirley,	–	48	36	–	–	–	–	–	–	–	–	139 50
Shutesbury,	–	16	25	–	–	–	–	–	–	–	–	87 50
Sterling,	–	–	25	–	–	–	–	–	–	–	1[2]	231 75
Stow,	–	–	42	–	–	–	–	–	–	18	–	131 31
Sturbridge,	–	11	35	–	–	–	–	–	–	–	–	116 45
Sudbury,	–	–	40	–	–	–	–	–	–	–	–	250 00
Sutton,	–	50	50	24	–	–	–	–	32	24	–	188 46
Tewksbury,	2	–	24	–	2	–	–	–	–	30	1[1]	174 00
Tyngsborough,	–	120	20	–	–	–	–	30	12	24	–	189 80
Upton,	–	–	18	–	–	–	–	–	–	–	–	128 53
Wales,	2	10	40	–	2	2	–	–	–	–	1[1]	236 77
Wendell,	–	–	8	–	–	–	–	–	–	12	–	35 07
West Bridgewater,	–	–	20	–	–	–	–	–	–	–	1[1]	200 12

[1] One-horse. [2] Two-horse. [3] Motor Truck.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT ACT — *Concluded.*

TOWN.	Axes.	Cans.	Extings.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wagons.	Reimbursement.
West Newbury,	–	10	6	–	–	–	–	–	–	–	–	$33 75
Westminster,	–	52	48	24	–	–	24	–	–	24	–	242 22
Wilbraham,	–	–	23	–	–	–	–	–	–	–	–	136 31
Wilmington,	–	12	40	–	1	–	–	18	–	34	–	187 38
Windsor,	–	–	30	–	–	–	–	–	–	–	–	150 00
Wrentham,	–	12	12	–	4	–	–	–	–	–	1[1]	210 10

[1] One-horse.

TOWNS RECEIVING FIRE-EQUIPMENT REIMBURSEMENT DURING YEAR 1912.

Acushnet,	$143 22	New Braintree,	$76 87
Ashby,	34 50	Norwell,	193 87
Auburn,	210 00	Pelham,	36 00
Avon,	9 90	Petersham,	202 55
Bedford,	28 75	Raynham,	172 23
Bellingham,	67 22	Rehoboth,	250 00
Berkley,	144 00	Richmond,	56 20
Berlin,	241 45	Royalston,	98 25
Blandford,	59 80	Rutland,	250 00
Boxborough,	90 00	Shelburne,	4 37
Boylston,	76 20	Shirley,	139 50
Brimfield,	99 75	Stow,	131 31
Chatham,	6 45	Sturbridge,	116 45
Dighton,	50 00	Sutton,	188 46
Erving,	75 00	Wales,	236 77
Freetown,	72 62	Westminster,	186 31
Georgetown,	43 50	Wilmington,	146 21
Gill,	65 00	Windsor,	150 00
Greenwich,	34 50	Wrentham,	210 10
Halifax,	205 91	Total,	$4,989 99
Harvard,	201 52	Unexpended balance,	10 01
Holbrook,	24 00	Total appropriation,	$5,000 00
Lynnfield,	86 25		
Merrimac,	75 00		

While the work of this branch of the department has progressed fairly well, it is by no means up to the standard. It is necessary that we have at least twelve substations in order to completely cover the State during hazy and smoky weather. We must have better fire-fighting organizations in many of the towns. Our forest wardens and their deputies must be men who have the faculty of handling men; they must be experienced in fighting forest fires; they should have telephone communication, so that observers can get them promptly in case of fire. Nearly all forest wardens are paid only while actually employed, and in ordinary years this means a very small remuneration. In order to secure good, desirable, efficient men they must be paid. The type of man needed has the ability

and energy to make more in some occupation, and he cannot afford to give his services or neglect his business at times for a few days' work. There are cases where men are doing such service because of their interest in the forests, but there is no good reason why a capable forest warden should not be paid as generously as any town officer.

Forest wardens should be provided with modern fire-fighting equipment. At least one-half of the towns within this Commonwealth have no equipment whatever for handling fires, and until the selectmen and residents of such towns provide their wardens with suitable equipment, just so long will they have disastrous fires. City fire departments that have an appropriation covering only their building and city fires should not be obliged to expend a large part of this fund in fighting forest fires, but a special fund should be available for such fires, and in many cities the city fire department should have jurisdiction only within the city limits. A town forest warden should be appointed who should have jurisdiction over all fires outside the city limits, and he should be supplied with the most modern equipment. In this way we shall accomplish results. Some of the most serious and damaging forest fires we have had this summer have come under the supervision of city fire departments, and were absolutely uncared for.

Another trouble we have experienced is in fires occurring just over the town line. There should be no town lines in fighting forest fires.

Through the courtesy of Mr. L. A. Wells, observer in charge of the meteorological observatory at the Blue Hill Reservation, we are able to submit a table showing the precipitation for the years 1910, 1911 and 1912, and also the normal rainfall (see page 55). This table shows that the rainfall for 1912 is 7.36 inches less than in 1911 and 8.61 inches less than normal. It shows that during the months of March, April, May, July and August the precipitation was above normal, but the rainfall in June was 2.54 inches below normal, there being but .53 of an inch rainfall that month. During the months of September and October, the time when our dangerous fires are liable to occur owing to the leaf fall and to frosts that kill the vegetation, the rainfall was 2.61 inches below normal. Taking into consideration the scantiness of the rainfall and the fact that the majority of the observers are new to the work, we feel that the results obtained have been very gratifying.

Detailed reports received from the town forest wardens show that we have, in addition to the forest wardens in the different towns, 1,640 deputy forest wardens, 1,135 of whom have telephone communication with the observation stations. These reports show that our wardens have issued 16,851 permits for burning brush, fallow, etc. We have 317 portable sawmills in operation throughout the State, of which 61 are in operation in District 1, 22 in District 2, 137 in District 3, and 97 in District 4.

Statistics show that over 350,000,000 feet of lumber are being cut in Massachusetts annually. This, in addition to what is being used for railroad ties and in wood-using industries, will soon exhaust all merchantable

timber within the Commonwealth unless some drastic measures are adopted prohibiting the wholesale cutting of the same. It is not only a matter of removing the merchantable timber, but nearly every party carrying on lumbering operations leaves a dangerous fire slash which at some future time is sure to cause a disastrous fire. These slashes could be prevented and the fire danger lessened very materially if a slash law were enacted making it necessary that all such slash be removed or burned. Legislation should be enacted compelling the screening of all portable steam mills, donkey engines, steam rollers, steam shovels and all other coal-burning boilers and locomotives that are in operation in or through forest areas.

The comparative table on page 56 shows acreage burned, cost to extinguish and damage caused by forest fires throughout the Commonwealth for the past five years. While the loss has been reduced from $537,749 for the year 1911 to $80,836 for the present year, it is still greater than it would have been provided we had had efficient fire fighting in every town. With the exception of a very few fires, the principal damage was caused by not leaving sufficient help at the fires after they were supposed to be under control. Many fires were left at night uncared for, only to be sighted by the observer the following day, and before sufficient help could be procured the fire was again beyond control. Again, we lost heavily in the practice of back-firing, which seems to be the only means that some wardens have of handling fires. This is absolutely uncalled for unless in the case of a crown fire. As long as a fire is confined to the ground there is no sufficient reason why it cannot be extinguished without back-firing.

Nearly all our serious fires were confined to the eastern part of the State We had no serious fires west of Worcester County, and the Cape country was without any damaging fires, as compared with previous years. The principal cause of fires in the Cape country in the past has been the use of defective locomotives. An effort has been made this season to overcome this trouble, special attention having been given to all locomotives running through the Cape country, with the result that very few fires have been started from this source.

The comparative table on page 56 shows that our losses were held very low until we experienced the severe drought during the month of October. While the month of June was exceptionally dry, with only .53 of an inch rainfall, our loss was held down to practically $12,000. The most serious fires occurred between October 15 and October 23. On Sunday, October 20, we had 51 fires burning in nearly as many towns, this being the record day of the season. These fires were confined to Norfolk and Plymouth counties.

We have been extremely fortunate this year in obtaining reports of fires. We have been able to have reports of practically every fire that caused any damage of importance. This is undoubtedly due in a measure to a small fee we have allowed each warden for such reports. As is indicated by the table on page 56 these reports show that 35.1 per cent. of all the fires reported to this office were of unknown origin. Many of these were undoubtedly caused by people traveling along highways and through

the forests and carelessly tossing away lighted matches, cigar butts or cigarette stubs. Cleaning up the inflammable material along the highways would eliminate a large number of fires from this source. Although the percentage of unknown fires is less than last year, it is by no means satisfactory. Each town should pay its forest warden a suitable salary, so that he can afford to make a careful examination regarding the circumstances attending each forest fire in his territory.

Railroads still head the list in the percentage of known causes. It will be observed that the percentage of railroad fires has increased considerably over the figures for last season, but this is explained by the decreased percentage of "unknown" and "miscellaneous" fires. The total number of railroad fires is slightly less than last season.

Early in the spring this office distributed to the forest wardens throughout the State 12,000 cloth posters on which were printed extracts from the Massachusetts forest fire laws. These were posted in conspicuous places in the forest area of the different towns. Notwithstanding this extensive posting of the fire laws the table shows an increase in the number of fires caused by hunters, smokers or berry pickers, indicating an attitude of carelessness on the part of the general public which must be combated by educational work and by a more active prosecution of offenders.

Reports show the present permit law, which has been in operation for the past two years in over 220 towns and cities throughout the Commonwealth, to have given general satisfaction. This law applies to all cities and to such towns as have accepted it at any annual or special town meeting. Our reports also show that 16,851 permits have been issued this year, and that the percentage of fires caused by burning brush, etc., has been reduced from 16.2 per cent. in 1910 to 5 per cent. this year, which is without doubt due to the enforcement of this law. There being less than 25 towns that have not accepted the act, it seems necessary that legislation be enacted making this law uniform throughout the State, thus eliminating the considerable dissatisfaction which has arisen in some parts of the State over the unequal application of the law.

The law relative to the appointment of forest wardens should be amended, allowing the appointment of such forest wardens to be made in January each year instead of in March or April, as it now is. Inasmuch as our fire season is at hand the first of March in ordinary years, the appointment of our men coming at that time allows us no opportunity whatever for perfecting our organization and instructing any new men who may be appointed. We are also unable to have a correct list of all forest wardens and their deputies for the use of our observation men until after the fire season is well advanced. By allowing the mayors and selectmen to make their appointments in January, we would have sufficient time to complete our organization and be in readiness for handling spring fires.

I am very much in favor of legislation being enacted this winter allowing the State to assume one-half the expense of fighting forest and brush

fires in all towns with a valuation of less than $2,000,000. While this means an additional appropriation by the State of from $7,000 to $10,000 each year, I feel that the results obtained would fully justify the expenditure.

It is needless to point out the value of the forests of a State to the people of that State as a whole, as distinguished from the citizens of the separate towns, for in many cases the products of these woodlands are not consumed within the towns themselves wherein they grow, but are used directly by the cities which have no forest area. This being the case, the welfare of the forest should be the interest of every citizen in the Commonwealth. In view of this, one of the chief defects of our present method of protecting the forests has been that we have left it wholly in the hands of the individual towns, without responsibility to any single head. This defect, of course, has been partly remedied by the organization of this branch of the department, and the benefits resulting therefrom are, we believe, already apparent. In many ways, however, the hands of the State Fire Warden, working through his deputies, are still tied, for while it is possible for him to devise many ways wherein towns may co-operate with each other and with his deputies, it is often impossible to properly carry out these plans because of the inability of the State under the present law to guarantee any substantial remuneration. Any business man will realize the futility of expecting satisfactory service for nothing, and the case of the State does not differ; in fact, we are constantly surprised at the amount of time and labor that have been given gratis in the past by our wardens. The zeal of a few wardens, however, cannot offset the carelessness of many. Furthermore, unpaid labor is usually spasmodic, and for these reasons the efficiency of the service as a whole deteriorates rather than increases under such a system.

It will be necessary to mention only a few ways in which the control established under a system of part payment of fire-fighting expenses by the Commonwealth would increase the efficiency of the fire-fighting service. A uniform rate of pay for all fire fighters could be put into effect, thus doing away with the disadvantage of having a difference in wage of from 10 to 20 cents an hour in adjoining towns, a condition which now exists and which has produced much discontent and inefficiency. Again, it would be possible to pay the local warden in each town an amount in some degree commensurate with his services, a state of affairs which does not now obtain in many cases.

The number of towns covered by the plan outlined above would be 194, as against the 172 covered under the present fire-equipment act, which is limited to towns having a valuation of $1,500,000 or less; and it is to be especially noted that the area occupied by these 194 towns comprises 80 per cent. of the woodland area of the State. That such a proposition is not an experiment is borne out by the fact that nearly all the eastern States are working under similar laws under which the State pays a fixed proportion of the fire-fighting cost (in most cases one-half), and thereby

obtains a better grade of men and of work than was formerly possible. That such results would be obtained here cannot be doubted, especially in view of the success of the present reimbursement act elsewhere referred to.

Aside from the above financial considerations, the value of our woodlands in other ways makes their protection imperative. No forester, and, for that matter, no person of ordinary powers of observation who has given any thought to the subject, can doubt the value of woodland as a retainer of the soil, a regulator of the stream flow, a cover for game, and a pleasure resort for the people. For these reasons alone, if the timber had no financial value, the woodland should be preserved. This has been said so many times as perhaps to weaken its force, but the observer need only look at such countries as France and China to be convinced of its truth; and the time is coming, and it is not far distant, when the people of the State will learn to use the woodland more and more as a place of recreation, as is the custom in foreign countries like Germany, where the tired city dweller takes his family with him to spend his holiday in the woods, and returns invigorated and refreshed.

Respectfully submitted,

M. C. Hutchins.
State Fire Warden.

Boston, Mass., Nov. 30, 1912.

Suggested Changes in Tree Warden Law.

The time is here, it is believed, when our cities and towns can ill afford not to have a trained man in their employ who has a practical working knowledge of forestry. We have been improving our conditions year by year. The old fire ward plan has been changed to the present forest warden system, and the local moth superintendents' work has been systematized so that it is improving each year. It now remains to readjust our tree warden law so that a trained man may be appointed who will be held responsible for getting results. There is no intention of casting any reflection upon the present tree wardens, as they have in most cases had little or no money to do with, and towns and cities have shown indifference to the position. There is also confusion in the minds of many between the duties of forest warden, moth superintendent and tree warden, which is perfectly natural. Many towns feel that the tree warden, by virtue of his election, must have the moth work to superintend, regardless of whether he has abilities in that direction or not. These misunderstandings have been unfortunate, for in order to get best results the work should not only be well done but should also

A hardwood growth that has been thinned and treated for gypsy and brown-tail moths. Note how white pine has seeded in. This is an example of how pine can be encouraged to supplant other species. Pickman estate, New Bedford.

A view of a road through North Shore woodland where the hardwoods have been cut out to eliminate the ravages of the gypsy moth.

run smoothly. The very fact that the tree warden is an elective office, and that there is frequent rivalry for the place, engenders feelings that are in themselves antagonistic. The reason that the forest warden work is advancing so well and with so little friction is that the office is not in politics, but depends on merit. This is equally true of the work of the moth superintendent. Were we to make the tree warden also appointive by the selectmen instead of elective, there is every reason to believe that the whole forestry plan would result in better work and at less expense. There would be a tendency to amalgamate the three positions into one. This could be done now only that it often happens that the tree warden who is elected is not a man sufficiently experienced to get results. The three town offices are each of importance, but if properly systematized the work could be planned so that one well-trained man could handle all. The setting out and pruning of trees could be done at a time of the year when there is little to be done on moth work, and hence the two kinds of work, if combined, would give continuous employment, and naturally interest a more stable and efficient class of employees. These same men, being in steady employ, could be utilized as the active force for fighting forest or brush fires. With the work thus systematized I am confident our future conditions will be far more satisfactory.

Gypsy and Brown-tail Moth Suppression.

The moth work has gone forward in a definite and systematic way and we have every reason to feel encouraged by the results. As stated under another heading, the State Forester is frank to say that the sooner we adopt scientific forestry methods just so soon will we take a forward step in their control. Ever since the work of moth suppression came under the control of this department it has been our constant aim to utilize forestry principles in combination with the other practices employed as the most effective method of getting results.

In the earlier days the moth problem was more confined to residential sections, and hence to parks, shade trees and shrubbery, and the methods of combating it were quite different from those at present in use. These insects now have spread out into the country, and the problem is one of fighting them under much more adverse conditions. Under city and village conditions

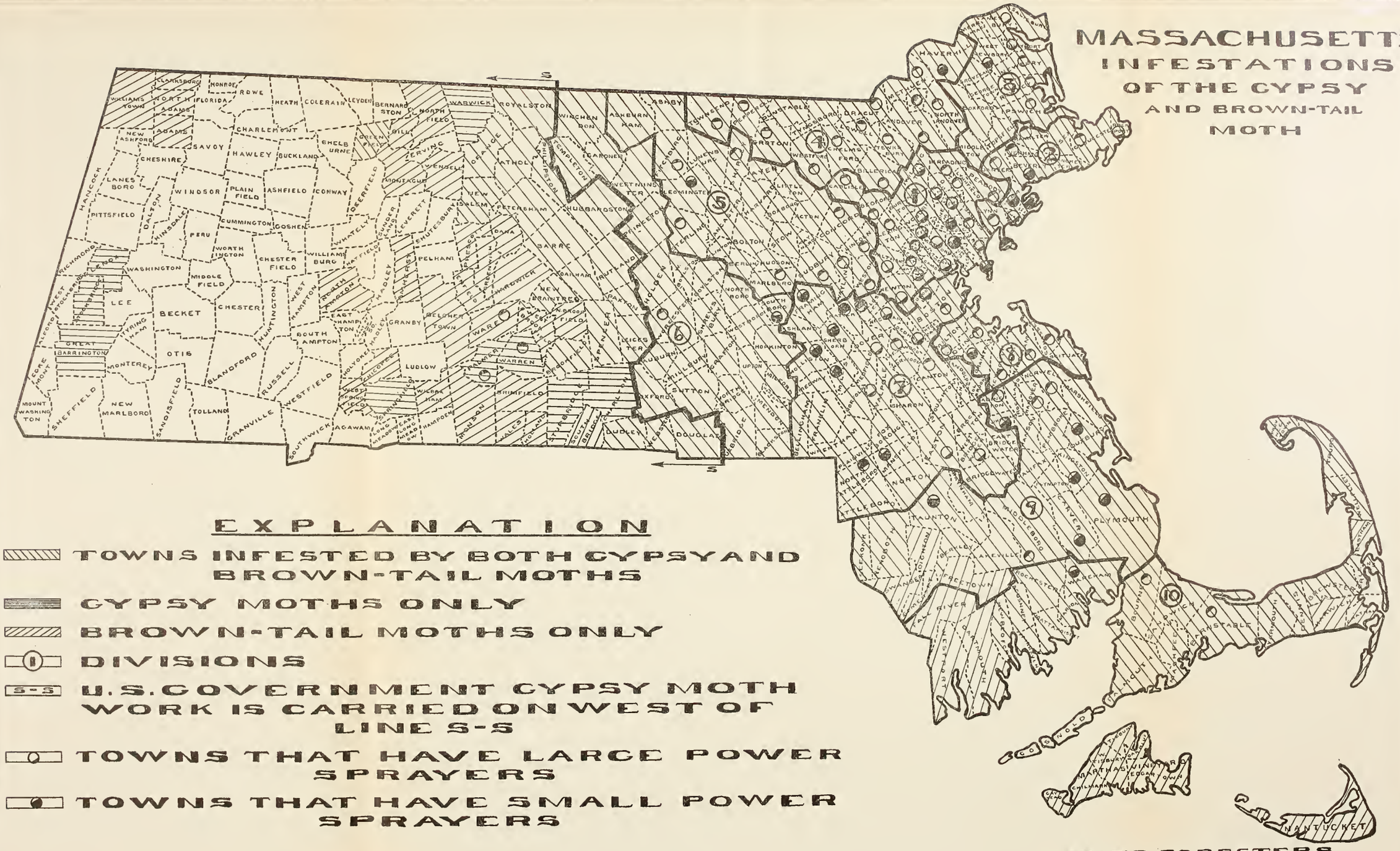
property is worth more and people are willing to expend more money to protect it; but when the moths spread out into the back wood lands, much of which is of extremely indifferent growth and in many instances comparatively worthless, the problem is quite different. The State law which gives protection in residential sections, requiring all property owners to pay in proportion to their valuation, ceases to be very effective when applied to cheap wood lands.

The problem of caring for residential conditions has been solved, and it is no more a perplexing question, for only in those cities and towns that are naturally nonprogressive in all their business relations is there likely to be any trouble. The purely country problem, however, is perplexing, and demands much more consideration. It has been the aim of the State Forester, therefore, to make the older sections, that have received assistance from the State for some time, assume the responsibility of self-support as rapidly as possible, so that the State's appropriation may be used where it is more needed, in the rural sections. In last year's report a brief account was published, so that no town could have an excuse for not knowing its conditions.

We have finally prevailed upon the federal government to assume the parasitic work, to which Massachusetts has contributed $15,000 a year until this season, and at present the government is preparing to establish a belt or picket line (see accompanying map) along our outer border of infestation, with the purpose of preventing the insects from spreading further. Hereafter everything beyond this border will be government work. This plan was advocated by the State Forester three years ago, and it is believed that now, with a more definite policy, the outlook is very bright for future work. This arrangement gives Massachusetts a definite work to perform, namely, to improve her internal conditions.

The infestation of the gypsy moth is not as great as we approach the government picket line, as some of the towns just within this line have but few of the insects. It is nevertheless important that these towns receive early attention from an economic standpoint. It seems to be natural that newly infested towns are relatively indifferent at first, and also, the employees are untrained and unskilled. This, together with the fact that most

MASSACHUSETTS
INFESTATIONS OF THE CYPSY AND BROWN-TAIL MOTH



EXPLANATION

- TOWNS INFESTED BY BOTH CYPSY AND BROWN-TAIL MOTHS
- CYPSY MOTHS ONLY
- BROWN-TAIL MOTHS ONLY
- (1) DIVISIONS
- S-S U.S. GOVERNMENT CYPSY MOTH WORK IS CARRIED ON WEST OF LINE S-S
- TOWNS THAT HAVE LARGE POWER SPRAYERS
- TOWNS THAT HAVE SMALL POWER SPRAYERS

STATE FORESTERS OFFICE 1913

F. L. HAYNES

towns insist on employing home labor, accounts for the unsatisfactory conditions that follow the early work. This criticism is simply to point out what this department has to contend with. I realize that it is perfectly natural that town officials feel it is encumbent upon them to give employment to their own townsmen in preference to others, but in this case it would be better to import an experienced foreman, at least until such time as local men have become sufficiently trained.

The State Forester believes that in dealing with this moth problem it will be good business to keep up the work of the present with the idea of gradually placing the burden upon towns and cities.

In my last year's report a definite recommendation was outlined whereby the State appropriation should be lessened $65,000 last year and $50,000 each year thereafter for three years. I am still of the opinion that we should carry out that policy. Such a gradual curtailment on the part of the State would not interfere with the efficiency of the work.

In dealing with the moth problem I am frank to say that every endeavor is being made to impress our employees with the idea, already alluded to in another place in this report, that better forestry is the solution. This means that we are to change our point of view from a policy that is unpopular and expensive, although necessary, to a constructive one, namely, the conservation of our forests. What a showing could be made were we able to utilize the present expenditure in moth work for pure forestry! It is firmly believed that with a consistent policy we may attain that much-coveted goal.

The practice of furnishing with supplies in place of money the towns and cities that the State reimburses has been carried out for the past three years, with great economy to the State.

During the past season some readjustments have been made in the moth divisions. Three of the division superintendents were supplied with runabout automobiles in place of motor cycles, and this made possible their covering larger territories. The price of runabouts has now reached a point where they can be used economically.

Private Property Work.

One of the most encouraging features of the year is the interest on the part of local superintendents in accomplishing as much work as possible that is self-supporting. A few years ago it was very easy for the public and private work to be so mixed that the cities and towns came to the State for a larger reimbursement than they should. Now we have a comprehensive knowledge of the area and the number of trees to be cared for in the cities and towns, and hence can estimate the approximate expense necessary to treat them. Once the strictly public work is planned for, the remainder of the trees in the city or town are cared for by the local superintendent at cost to the owner. This method has had a tendency to make individuals depend upon the town force to do their work, or have it done for them. The more private work that a superintendent can get done, the less the amount of future public work, since the one spreads to the other. The amount of private work accomplished in many places the past season is certainly creditable to the local officials in charge. In order to accomplish this work, as alluded to elsewhere in this report, equipment and trained, reliable employees are essential.

Work on State Highways.

During the past year the moth work on the State highways has been done under the supervision of this department, and the expenses paid by the highway commission. Besides the gypsy and brown-tail moth work we also attended to the elm-leaf beetle spraying and did some improvement pruning. This work is usually done by our various local superintendents, under the supervision of this office. It is believed that the highway commission should be given a much larger appropriation for this and similar work. Next to good roads themselves, well-planted and properly cared for shade trees are appreciated by everybody; in fact, they make a country desirable to live in. In this connection I would suggest the advisability of making the town tree warden an appointive rather than an elective office, similar to the forest warden appointment, so that if a definite policy for setting out and caring for shade trees were outlined results would follow. At present, one town does well, while its neighbor may be indif-

ferent. The tree warden, since the position is an elective one, is also changed too often, and is usually given little financial backing.

Work has been done in the following cities and towns on the State highway, and paid for by the highway commission: —

Acton,	$186 17	Methuen,	$95 30
Amesbury,	56 28	Middleborough,	95 52
Andover,	85 63	Millbury,	47 50
Ashby,	21 75	Milton,	7 92
Ashland,	84 00	Newbury,	73 40
Attleborough,	34 90	Newburyport,	40 05
Barnstable,	150 00	North Andover,	150 60
Barre,	17 83	North Attleborough,	70 45
Bedford,	59 75	North Reading,	21 00
Beverly,	374 67	Northborough,	119 10
Billerica,	63 75	Norton,	45 70
Boxborough,	194 10	Norwood,	17 75
Brewster,	82 95	Orleans,	25 00
Bridgewater,	119 04	Pepperell,	81 41
Brockton,	63 13	Plainville,	23 90
Burlington,	61 00	Raynham,	13 00
Chatham,	25 00	Reading,	153 00
Chelmsford,	85 80	Rehoboth,	149 50
Concord,	507 94	Rockland,	82 35
Dennis,	57 40	Rowley,	85 71
Dighton,	114 35	Salisbury,	75 69
Dracut,	68 10	Scituate,	102 50
Duxbury,	13 80	Somerset,	198 75
Falmouth,	91 56	Sterling,	63 86
Fitchburg,	62 73	Stoneham,	100 80
Foxborough,	75 00	Sudbury,	139 90
Framingham,	55 62	Sutton,	10 75
Gloucester,	14 70	Swansea,	115 38
Grafton,	47 50	Taunton,	47 25
Groton,	120 85	Templeton,	67 25
Groveland,	71 10	Tewksbury,	99 27
Harvard,	63 98	Townsend,	274 50
Harwich,	25 00	Tyngsborough,	147 00
Haverhill,	149 74	Wayland,	61 75
Hingham,	21 63	Wenham,	136 96
Holliston,	180 62	West Bridgewater,	19 15
Hudson,	31 50	West Newbury,	154 90
Ipswich,	43 48	Westford,	123 00
Lakeville,	30 67	Weston,	113 30
Lancaster,	55 58	Wilmington,	22 80
Leominster,	35 25	Winchester,	265 91
Littleton,	61 95	Woburn,	92 20
Lowell,	28 34	Worcester,	18 92
Lunenburg,	60 19	Wrentham,	40 00
Mansfield,	19 64	Yarmouth,	150 00
Marion,	8 00		
Melrose,	78 60		$8,064 22
Merrimac,	63 70		

In the following towns work was done on the State highways under the direction of the State Forester's office, and paid for by the State Forester from the appropriation for the suppression of the gypsy and brown-tail moths: —

Abington,	$19 25	Newbury,	$55 08
Bedford,	27 17	Norfolk,	10 50
Bellingham,	12 90	North Attleborough,	3 00
Braintree,	38 00	Pembroke,	6 50
Cohasset,	32 72	Quincy,	12 00
Dover,	24 50	Randolph,	17 80
Duxbury,	8 04	Scituate,	88 74
Hamilton,	113 32	Shrewsbury,	272 50
Hanover,	24 18	Southborough,	30 62
Hingham,	85 00	Stoneham,	62 78
Kingston,	9 28	Stoughton,	41 00
Lincoln,	87 59	Weymouth,	138 61
Marlborough,	197 36	Wilmington,	48 44
Marshfield,	20 97	Winchester,	49 56
Melrose,	46 24	Woburn,	213 86
Millbury,	4 47		
Natick,	58 89		$1,860 87

Parasite Work.

Report of Dr. L. O. Howard, Chief of the Bureau of Entomology, Washington, D. C.

United States Department of Agriculture,
Bureau of Entomology, Washington, D. C., Dec. 7, 1912.

Prof. F. W. Rane, *State Forester, 6 Beacon Street, Boston, Mass.*

Dear Professor Rane: — In accordance with your request, I take pleasure in enclosing a report on the parasite work of this year, for inclusion in your annual report.

Yours most truly,

L. O. Howard,
Chief of Bureau.

Down nearly to the date when I submitted my last report to you, namely, Dec. 15, 1911, all of the work on the parasites of the gypsy moth and brown-tail moth had been carried on co-operatively between the State of Massachusetts and the Bureau of Entomology of the United States Department of Agriculture, and on the whole the expense of the work was about equally shared. The co-operation on this project between the State and the Department of Agriculture was in effect for about six years, and was thoroughly satisfactory. Without the assistance of the State the operations by the department could not have been carried on upon so large a scale as has been possible. The most cordial relations have

existed and the most perfect facilities have been offered to experts of the Bureau at the expense of the State. The growing importance of the work, and the urgent need for the diversion of all possible State funds to other aspects of the investigation, brought about a transfer, which was entered into Dec. 1, 1911, all of the parasite work being taken on by the Bureau. A number of State employees were transferred to the Bureau rolls, so that their previous training and experience were available.

In my report to you submitted December 15, I summarized most of the results of the year 1911, including many facts in addition to those contained in my annual report as Chief of the Bureau of Entomology, which considered matters only down to the 1st of July. Most of the material received during the latter part of the season of 1911 was wintered at the laboratory at Melrose Highlands, and during the spring of 1912 there was a good emergence of parasites, and several vigorous colonies were liberated. The parasite found by Mr. Fiske in Sicily in 1911, and of which 125,000 cocoons were sent over, survived the winter successfully in Massachusetts, and during May and the first half of June, 1912, about 12,000 adults were put out in the field. A species of *Apanteles*, which was received in small numbers, passed through the winter in good condition, and a small colony was placed out. Females of this species lay their eggs in small caterpillars, and the insect has now passed through a generation since it arrived in this country.

The egg-parasite known as *Anastatus bifasciatus*, a species having only one annual generation, and coming from both Japan and south Europe, has been breeding in practically all of the places where it has been colonized. It spreads very slowly, however, and it is necessary to make many plantings in order that it may become generally distributed. In some of the collections of egg masses, as high as 47 per cent. of the eggs were found to be parasitized. More than 700 additional colonies of this species were put out during the spring of 1912.

The Japanese egg parasite, *Schedius kuvanæ*, has been increasing rapidly, has several generations each year, and the outlook for its perfect establishment is very favorable.

Never, however, under any circumstances, may we expect that these two egg parasites together will destroy more than 40 per cent. of the eggs, since they are confined in their operations to the upper layer of eggs in any given egg mass. A reduction of 40 per cent. in the eggs, however, will be a great gain.

The European Calosoma beetle has become thoroughly established, and has caused much destruction among gypsy moth caterpillars and pupæ. It has been found in numbers as far north as Portsmouth, N. H., and in practically all of the towns in New Hampshire south of a line drawn from Portsmouth to Lowell, Mass. Last year this species was found in only a single town in New Hampshire. In the central infested district in Massachusetts adults and larvæ of this species, both of which feed upon gypsy moth caterpillars and pupæ, were so common that they were ob-

served by many citizens, and many specimens have been found on the sidewalks in the suburbs of Boston, where they had been stepped upon by pedestrians.

The European Tachinid fly, *Compsilura concinnata*, was also very abundant this year, and did excellent work in the vicinity of Boston. From a collection of about 12,000 caterpillars made in Stoneham, Saugus and Melrose, Mass., it was found that over 25 per cent. were parasitized by this insect.

An unlooked-for development occurred during the summer when small gypsy moth caterpillars were found to have been parasitized by *Apanteles lacteicolor*, another introduced parasite. Previously, only a single cocoon had been collected, in the summer of 1911. During the summer of 1912 the parasitism of gypsy moth caterpillars by this insect has been found over a wide area, from as far north as Manchester, N. H., to Hudson, Marlborough, and towns in this vicinity in Massachusetts, and also in towns around Boston. On account of the difficulty of observing this species, it is probably safe to say that a large amount of beneficial work performed by it has escaped notice.

Some of the other parasites, such as the Tachinid, Blepharipa, are increasing, as has been demonstrated by the work done during the past year.

In several places in the area which was badly infested during past years, it is a fair estimate that 50 per cent. or more of the gypsy moth larvæ, pupæ and eggs were destroyed during the summer of 1911 by the parasites above mentioned. In other areas, farther from the centers of parasite plantings, of course, so good a showing was not made.

It should be stated that the wilt disease was present during the season of 1912 as heretofore. It was almost impossible to find an infested area where the disease was not present some time during the caterpillar season.

The present condition of the brown-tail moth indicates a greater measure of control by introduced parasites than ever before. During the spring of 1912 climatic conditions were such that the fungous disease which attacks this insect in early June did not develop to any marked extent in the region about Boston. The previous winter was very severe, and many collections of brown-tail nests were made to determine the number of caterpillars which died in the webs during the winter from cold weather or other causes. The records from Maine, New Hampshire and the western part of the infested area in Massachusetts showed that a far larger percentage of dead caterpillars were found in the webs than in the districts surrounding Boston. This being the case, one would naturally expect a large increase in the brown-tail moth infestation about Boston this autumn. The condition of infestation, however, is not nearly so great as would be expected, and, as the fungous disease worked to a very slight extent in this particular region, it is reasonably obvious that the parasites were largely responsible for the present decrease. Collections and recoveries from the field also showed that the species which were most abundant in this region last year were far more common in 1912. *Apanteles lacteicolor*,

Meteorus versicolor and *Compsilura* were very common and doing effective work.

The parasites of the brown-tail moth, referred to in last year's report have increased in spread over a much larger territory than last year. The trend of the dispersion has been in a north and northeast direction, and has followed the same general lines as the brown-tail spread. The Chalcidid parasite, *Monodontomerus æreus*, has been found beyond the city of Bangor, Me., and as far north as the brown-tail moth has spread in New Hampshire. In Massachusetts and Rhode Island the spread of this species very nearly covers the range of the brown-tail moth. The first of the brown-tail moth winter nests parasites to be found established in this country, and to which I have made frequent references in my reports to you, namely, *Pteromalus egregius*, has also showed a good increase and spread over the previous year.

In furtherance of the proposed study of European conditions, especially regarding parasitic control in Europe, Mr. W. F. Fiske, with two experts assistants, was located in south Europe during the winter, spring and early summer.

It is especially encouraging to note that over a considerable territory centering a little to the northward of Boston, in which a greater variety of parasites are established in greater abundance than elsewhere, the effects of their importation are already noteworthy. It is safe to say that, on the most conservative estimate, 50 per cent., or one out of every two eggs, caterpillars or pupæ of the gypsy moth, was destroyed by imported parasites in 1912.

Present Status of the Wilt Disease or "Flacherie."

When one reflects upon the tremendous capacity of the gypsy moth for causing damage to woodlands and shade trees, and fully realizes the vast amount of money which has been expended by Massachusetts in her efforts to suppress it; and moreover, as it is obvious that the spread of the moths over thousands of square miles, in many sections of which it is still abundant, justifies the belief that we shall be compelled to continue the fight against it indefinitely, unless more effective methods than those now employed are discovered, the State Forester's position easily may be understood in attempting to utilize anything which offers reasonable hope of effectiveness. In former reports reference has been made to the experimental work with the "flacherie" or wilt disease, which has been carried on under the direction of Dr. W. M. Wheeler of the Bussey Institution of Harvard University. The experiments were continued during 1912, and owing to improved facilities for developing it a greater number of plantings of the

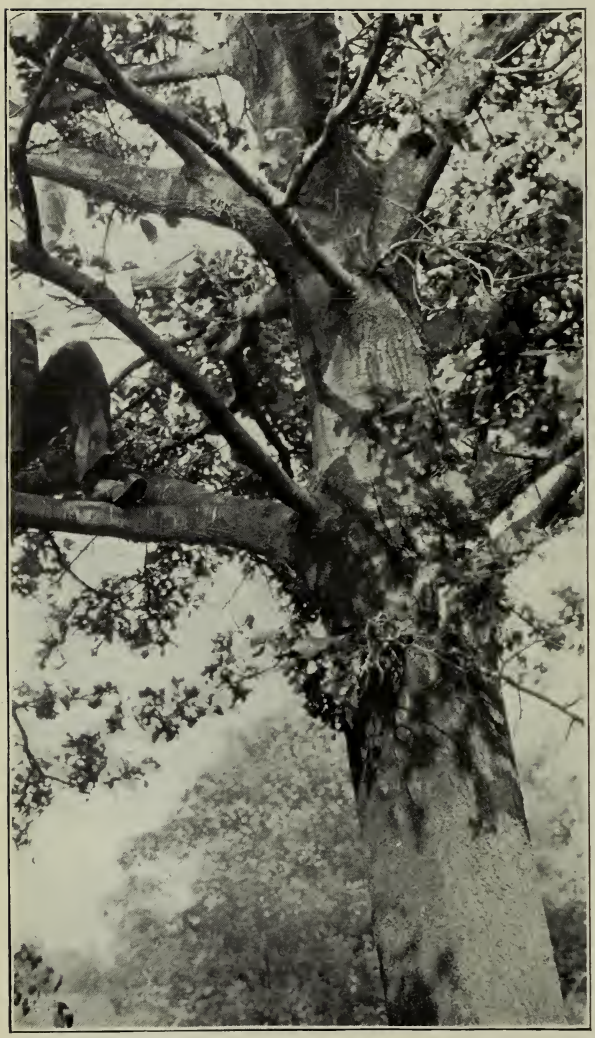
material were made than in any previous year. In fact, the disease has now been distributed over the entire moth-infested area of the State. In view of the fact that the results of this planting are still problematic, it does not seem advisable to persevere in this work. Further investigations show that our knowledge of the disease is still fragmentary, and we must wait further development before expending more money. The experimental and scientific side of the work is now being prosecuted systematically by the United States Bureau of Entomology and by Harvard University in co-operation. We append a letter recently received from Professor Wheeler of the Bussey Institution of Harvard University which explains more fully the feeling among scientists in regard to the probability of success in attempting to spread wilt disease of the gypsy moth artificially. Professor Wheeler is not alone in his opinion, for it is shared by the most celebrated scientists abroad and by many prominent entomologists here in Massachusetts.

"Flacherie" Opinion of Professor Wheeler.

Bussey Institution, Forest Hills, Mass, Nov. 20, 1912.

Mr. F. W. Rane, *6 Beacon Street, Boston, Mass.*

My dear Mr. Rane: — In obedience to your request I beg leave to submit to you my opinion in regard to continuing the practice of attempting to spread the wilt disease, or "flacherie," of the gypsy moth caterpillars by artificial means in the forest lands of eastern Massachusetts. It is obvious that any attempt thus to utilize the wilt disease in practice must be based on a precise knowledge of the methods whereby the disease may be contracted by healthy caterpillars. Although we have good evidence for believing that the disease may be contracted by healthy caterpillars that have fed on the excretions of diseased caterpillars, or the deliquesced portions of caterpillars that have died of the disease, we have at present no data to prove that the disease can be transmitted from diseased to healthy caterpillars by mere bodily contact or by germs borne through the air. Many experiments have been performed for the purpose of proving the method of transmission last mentioned, but these, in my opinion, have given merely negative or highly equivocal results, owing to the fact that the disease, in a mild or latent form, is chronically, and perhaps hereditarily, present in practically all the localities in which the caterpillars occur in eastern New England. The acute and economically important phase of the disease may, therefore, arise through unusual meteorological conditions, or through peculiarities of the plants on which the caterpillars happen to be feeding. Hence, there is no advantage in



A photograph showing millions of dead brown-tail larvæ on the under part of the limbs, as the result of a single planting of the fungous disease.

continuing such experiments till the precise methods of infection and of its specific organism have been determined by carefully controlled laboratory experiment and protistological investigation. Such investigations are being pursued, with improved facilities, by the federal Entomological Bureau in co-operation with the Bussey Institution of Harvard University, and may be expected to yield, in the not too distant future, some adequate theoretical basis for a sound practical utilization of the disease in the field.

Very sincerely yours,

W. M. Wheeler,
Professor of Economic Entomology.

The Fungous Disease of the Brown-tail and Gypsy Moths.

The same co-operative arrangements, as heretofore, were made with Harvard University, through Dean W. C. Sabine and Dr. Roland Thaxter, for carrying on this work. Mr. R. H. Colley was in charge assisted by some of our regular employees when occasion demanded it. The work was carried on at the Harvard Botanic Gardens, and we are greatly indebted to Harvard University for the use of their greenhouse and cold frames as well. The following report by Mr. Colley explains itself: —

Planting was commenced on the 6th of May, a week later than in previous seasons, on account of the late start of the larvæ in the field and general cold weather conditions, and continued until the 6th of June. Mailing cases again were used for the distribution of the diseased caterpillars. In sending out the material it was planned to supply the different districts with infected larvæ on definite dates, to ensure, as far as possible, that the planting would be done immediately on receipt of the material. This scheme was adhered to, with few exceptions. Approximately 200 cases were shipped to State and town superintendents all over eastern Massachusetts. The division superintendents supervised the work in order to acquaint the town men with the proper methods of handling and planting the material. Besides this distribution about 100 cases were shipped to private individuals during the first week in June.

The results of nearly all of the plantings were very satisfactory. Inspection of the planted areas by local and division superintendents showed that the disease had materially decreased the number of larvæ, and in some cases had killed practically all of them. Some failures were reported, which were undoubtedly due to delay in transit or material sent out when the infection in the disease boxes was low. Viewing the work as a whole, the season may be said to have been very successful. The results certainly seemed to indicate that a more extensive planting of the fungus would be even more effective in reducing the numbers of the caterpillars.

To carry on the work properly a breeding and infection house is needed in which light and heat can be well regulated. A good supply of clean dry nests for cold storage is also absolutely necessary. This supply should be large enough to furnish caterpillars for running at least twenty-four disease boxes, a number which ought to yield enough diseased larvæ to supply every infested town in the State. To feed such a large number of caterpillars some arrangements should be made for procuring a sufficient quantity of willow and cherry twigs, or for the cultivation of raspberry bushes, which yield tender leaves especially suited to the needs of the very young larvæ. Success depends on a large quantity of well-infected material which can be rapidly transported to the field. If this material is quickly and properly planted, there can be no question as to its effectiveness in destroying the brown-tail caterpillar.

It was impossible to run the brown-tail fungus through the summer in the disease boxes, on account of the lack of a proper supply of larvæ in cold-storage, but the infection was successfully started from diseased webs during the first week in September.

In the case of the experiments with the gypsy fungus the results were not satisfactory. The larvæ did not thrive well in the breeding boxes, because the conditions in the boxes, where warmth and moisture were at an optimum for *Entomophthora*, were extremely favorable for the development of wilt, and the caterpillars died from this disease before the fungus could spread. Another factor which makes the propagation of the disease difficult is the apparent low virulence of the species which attacks the gypsy moth. Only one planting was made, at Stony Brook, about the 25th of June. Inspection ten days later resulted in the finding of one dead caterpillar, on a small branch about five feet above the bag in which the diseased larvæ had been planted. No other evidence of the fungus could be found. That the gypsy fungus will prove as destructive as the brown-tail fungus seems, in view of the negative results so far obtained, to be very doubtful, but there is a possibility that it may get started from some of its numerous resting spores which must be in the field in localities where the fungus was planted, in which case its effectiveness might prove to be greater than our experiments would indicate.

Quarantine against the Gypsy Moth and the Brown-tail Moth.

As a result of a hearing held at Washington, D. C., on Oct. 29, 1912, before the Federal Horticultural Board, the Department of Agriculture has established a quarantine against the above-named moths which took effect on and after Nov. 25, 1912. The regulations are as follows: —

Gypsy Moth Regulations.[1]

Coniferous trees of the area quarantined for the gypsy moth, such as spruce, fir, hemlock, pine, juniper (cedar), and arbor-vitæ (white cedar), known and described as "Christmas trees," and parts thereof, and decorative plants of the area quarantined for the gypsy moth, such as holly and laurel, known and described as "Christmas greens or greenery," shall not be moved or allowed to move interstate to points outside the quarantined area.

Forest plant products of the area quarantined for the gypsy moth, including logs, tan bark, posts, poles, railroad ties, cordwood and lumber, and field-grown florists' stock, trees, shrubs, vines, cuttings, and other plants and plant products for planting or propagation, of the area quarantined for the gypsy moth, excepting buds, fruit pits, seeds of fruit and ornamental trees and shrubs, field vegetable and flower seeds, bedding plants and other herbaceous plants and roots shall not be moved or allowed to move interstate to any point outside the quarantined area unless and until such plants and plant products have been inspected by the United States Department of Agriculture and pronounced free from the gypsy moth.

Brown-tail Moth Regulations.[1]

Deciduous trees or shrubs of the area quarantined for the brown-tail moth, or parts thereof, including all deciduous field-grown florists' stock, vines, cuttings, grafts and scions, shall not be moved or allowed to move interstate to points outside the quarantined area, unless and until such plants and plant products have been inspected by the United States Department of Agriculture and pronounced to be free from the brown-tail moth.

North Shore Work.

The co-operative work along forestry and moth lines that has continued now for several years between the summer residents committees, the towns and the State Forester's department, has again been continued throughout the past season. The State Forester wishes to acknowledge the very public-spirited interest that has been shown generally in this work, and especially is he indebted to Col. Wm. D. Sohier for his unfailing support, which has made the work possible.

The following is a reproduction of that portion of the summer residents committees' report that relates to the moth and forestry work: --

[1] Blanks on which to make application for inspection or for permits to ship will be furnished upon request by the United States Department of Agriculture, 6 Beacon Street, Boston, Mass.

Gypsy Moth and Road Work on the North Shore.

General Purposes.

This is the fifth season that your committees have been engaged in preserving the forests on the North Shore. Each year the work has been more and more consolidated for the purpose of preserving the woods directly back of the valuable shore property, and also for the purpose of preserving a strip 200 feet wide on the sides of our beautiful wooded drives.

The conditions in the woods as a whole on the North Shore are much better in 1912 than they have been at any time in the past.

The fact has been demonstrated beyond question that by thorough, systematic work the forests can be preserved, and we think improved as well. Half measures are merely a waste of money. The taking out of the poorer trees and of the dead wood will undoubtedly in a short time result in much better forests.

Scope of the Work.

Your committees have continued their policy of co-operating with subscribers who are doing thorough work, by endeavoring to give them a protective belt back of their estates.

We have now cleared up, creosoted and sprayed a strip 200 feet in width on the sides of all of the wood roads, — something over 30 miles, — besides caring for the woods on the sides of the main roads. The work has been done all the way from Beverly Hospital in Beverly, nearly down to the line of Gloucester harbor.

In the interior of the woods very little, if any, work has been done. While in many places there is a large number of dead trees, they are mostly the weaker trees, which could not stand one stripping, but it has seemed to the inspectors, and to the writer, after considerable exploring, that even in these woods the conditions are much better than they have been before.

The summer residents in Magnolia contributed nearly $3,000, and we secured an equal amount from the State, but this year the city of Gloucester refused to contribute the $2,500 which it had been contributing for the past two years.

The work of cleaning up the whole block on the east side of Greenwood Avenue is nearly completed, so that Pride's Hill, with its beautiful woods, will be preserved. They were in very bad condition.

Parasites.

More parasites were planted again this year, and I think the conditions in the back woods indicate clearly that the parasites have been increasing. We also put out a large number of diseased caterpillars and flacherie, or the so-called "wilt disease." This latter was effective in many places.

While it will be several years before the parasites, that attack the moth in all the stages of its growth, will be thoroughly developed, they will certainly render substantial aid in the back woods.

One of the cheapest and most effective methods of preserving the woods, and reducing the cost of the work, is to cut out all the trees, like the white oak, etc., which are particularly infested by the gypsy moth, and leave only the more resistant trees, such as pines, hemlocks, beeches, etc. We are doing this wherever we can, and the results are excellent. If one can cut all the white oaks, even, it will add greatly in reducing infestation, and make the work much easier and less expensive.

Future Work.

It seems as if in the future we could, to a certain extent, curtail the amount of work that is to be done where the woods are not of any great public value, and we are doing the work merely to preserve the forests which can be seen and the private estates. In some colonies it will be possible to get along with merely creosoting for one year, and still keep the gypsy moth under control; in other colonies we can spray and do no other work. It is possible, in a few of the back colonies, that we can work only alternate years, and still prevent the gypsy moth from increasing.

Work done.

We exceeded all former records this year, partly because we were favored with good weather, but principally because of the increased efficiency of our men and our spraying machines.

There were 3,774 acres sprayed in twenty-three days. We had 13 power spraying machines actively at work, and 1 motor truck spraying machine. This truck took care of all the roadsides very much more advantageously, and for very much less money, than they had ever been cared for before.

We had only two serious breakdowns, but in each case the spraying machine was repaired over night and was working the next day. We are now organized so as to do our own work and repair our own machines.

To a large extent this increased efficiency was secured by employing a high-priced and competent mechanic, and by keeping the parts and supplies constantly on hand.

Your committees have adopted the policy of keeping enough of its more experienced men employed during the winter so that it will have efficient and competent foremen to direct the work the next year. This has proved a great economy.

When the work started, with the low-power spraying machines we could not throw to the tops of the trees. It was then considered a good day's work when a gang of 11 men and 1 power sprayer sprayed 5 or 6 acres a day. This year it was no unusual occurrence, where conditions were favorable, for one of the new machines, with the same number of men, to spray 18 acres a day.

The average acreage sprayed by each machine this year was something over 12 acres per day for the whole twenty-three days. We sprayed on an average 164 acres a day.

Plant.

Your committees have now 1 automobile truck equipped for spraying, 12 modern power-spraying machines, 3 auxiliary pumps, 1,000 feet of hose with each spraying machine and with each pump, and 2 watering carts.

This year we bought 1 new sprayer and rebuilt 3 of the old ones, making them as good as new. We have still two or three machines which are two and three years old, which will probably be sold.

Persons in Charge of the Actual Work.

The actual work was in charge of the State Forester's department, under Mr. F. W. Rane. Mr. George A. Smith, gypsy moth superintendent supervised the work, and was extremely efficient and interested. Locally, the work was in charge of Mr. Saul Phillips, who has been in charge practically ever since the work started, five years ago. He had with him his assistant, Mr. M. H. Donovan.

Your committees arranged that, in order to secure efficient inspection and rapid repairs, Mr. Phillips should have an automobile and Mr. Donovan a motorcycle. Your committees feel that we owe a great deal to these gentlemen and their able foremen for their tireless labors, especially during the spring season.

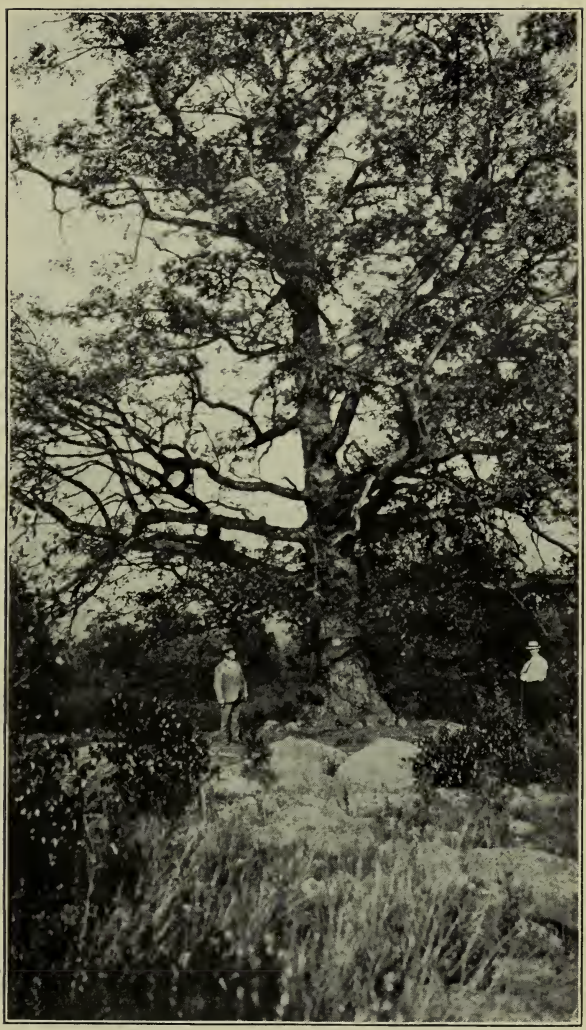
Under the State law it is doubtful whether it was legal for the men to be employed more than eight hours a day. The men desired to work more, and would have left us if they had not been allowed to work more hours, because they wished to secure the additional pay. Consequently, your committees arranged so that the men worked for the State eight hours a day, and your committees employed them and paid them at the same rate for the additional hours they put into the work, thereby securing the best results.

It seemed to your committees that the authorities should have ruled that this was emergency work, as it was evident that curtailing the hours would mean that 30 less acres would be sprayed each day and that the moths would be allowed to destroy the woods on that much territory, or at any rate seriously injure them, and of course it is clearly evident that 30 acres a day less for the twenty-three days would mean that the moths would have been allowed for that thirty days to defoliate some 690 acres of woods.

We hope that some legislation will be passed this year which will help the matter and exempt spraying, at least, from the eight-hour law.

How the Money was Secured.

Governor Foss early in the year agreed that the State would co-operate in 1912 as it had been doing ever since 1908. The State Forester's department took charge of the whole work. The following appropriations were secured: —



A mammoth pasture oak that was badly infested with gypsy moth egg clusters. This photograph was taken at the end of the feeding season, showing how the foliage has been maintained; the only treatment was the banding of the trunk with tanglefoot.

Commonwealth of Massachusetts,	$22,500 00
City of Beverly,	5,000 00
Town of Manchester,	5,000 00
Contributed by your committees,	23,000 00
Collected from private owners for work done on the woodland,	4,360 77
	$59,860 77

This money was all paid into the State treasury for moth work on the north shore, to be used by the State Forester's department.

His Excellency Governor Foss has at all times been interested and ready to co-operate with the efforts of your committees. Had it not been for this co-operation our forests would undoubtedly have been destroyed.

Expenditures.

According to the report of the State superintendent, the expenditures were as follows: —

From July 16, 1911, to July 30, 1912,	$55,453 94
Tools and supplies bought for 1911 work,	18,520 89
Balance,	$36,933 05
Due for tools and supplies, 1912 work,	13,516 75
	$50,449 80
Less value of tools and supplies on hand,	13,421 84
Actual cost of the work done by State,	$37,027 96
Overtime paid by committees,	974 02
Total cost of work, not including plant,	$38,001 98

Details of Cost of the Work.

Spraying,	$17,328 56
Cutting and burning,	13,251 67
Creosoting,	6,316 13
Tanglefooting,	744 60
Leopard moth work,	238 29
Road repairs,	73 10
Replanting wilt disease,	49 63
	$38,001 98

The Work accomplished.

Roughly speaking, about 1,000 acres of woodland were cleared and sprayed in 1908, about 2,100 acres in 1909, about 3,000 acres in 1910, about 3,200 acres in 1911, and over 3,600 acres in 1912.

The cost of the work was approximately as follows: —

1,000 acres in 1908,	$60,000
2,100 acres in 1909,	60,000
3,000 acres in 1910,	57,000
3,200 acres in 1911,	54,500
3,600 acres in 1912,	38,000

The acreage cared for in 1912 was three and one-half times that cared for in 1908, and the expenditure only three-fourths as much.

We also did some fall spraying in the fall of 1911 for brown-tails on 162 acres. Our force varied from 25 men to over 150.

Average Cost of the Work.

Spraying 3,774 acres,	$4 59 per acre.
Creosoting 2,744 acres,	2 30 per acre.
Cutting 1,368 acres,	9 68 per acre.

These costs do not include tools, plant, etc., nor depreciation, merely labor and materials.

Where work was done on private estates, which was only in the back woods where it came in connection with other work your committees were doing, the cost of the work is being repaid by the owners whenever they can afford to pay for it.

Co-operation by the Commonwealth and the Cities and Towns.

Your committees feel that the summer residents owe a great deal to Governor Foss and his State officials, the State Forester, superintendent and men in charge of the work, to the mayor and city government of Beverly, and to the selectmen of Manchester, for their generous help and co-operation, without which it would have been impossible for your committees to have done systematic, thorough and efficient work against the gypsy moth under one responsible head, and without regard to town lines. The selectmen of Hamilton have also co-operated by caring for many of the woods in that town. Without this co-operation and the money given by the State, municipalities and subscribers, our forests and beautiful shore would have been greatly injured.

It requires a large amount of pluck, as well as sound business judgment on the part of city and town officials in these days, to authorize the spending of money in their charge by an outside committee or commissioner, or by others than town and city officials. We believe, however, that the results obtained are ample justification of their action.

Our Hopes for the Future.

Our forest can be preserved, our wood roads protected and the shore remain as beautiful as it is now, provided the work is continued on the lines on which it has been begun.

It is the opinion of the best experts that in the back woods the various parasites will soon maintain a kind of equilibrium which will prevent the trees which are yet particularly susceptible to the attack of the gypsy moth from being destroyed.

Your committees hope that the subscribers, the Commonwealth and the cities and towns will co-operate in the future as they have in the past. They hope that every resident and summer resident on the North Shore

who has enjoyed our woods, our trees and our dustless roads, and who has not yet subscribed, or who has not yet given his fair share towards the cost of this work, will co-operate by sending a check to Wm. D. Sohier, agent, 15 Ashburton Place, Boston, Mass.

A list of the subscribers is published herewith.

Wm. D. Sohier,
For the Committees.

Beverly.

Oliver Ames.
Charles H. Tyler.
Wm. D. Sohier.

Manchester.

Maj. Henry L. Higginson.
Gardiner M. Lane.
George Wigglesworth.

Summer Residents Committees.

Subscriptions for Gypsy Moth Work on the North Shore, 1912.

Beverly.

Henry C. Frick,	$2,000 00	Mrs. E. C. Swift,	$150 00
Hon. Wm. H. Moore,	1,000 00	Mrs. John S. Curtis,	150 00
W. S. and J. T. Spaulding,	500 00	Philip S. Sears,	150 00
Mrs. Chas. H. Dalton,	400 00	F. J. and Alice Cotting,	125 00
Mrs. R. D. Evans,	300 00	George S. Mandell,	100 00
Dudley L. Pickman,	300 00	F. I. Amory,	100 00
Hon. Wm. C. Loring,	250 00	Allen Curtis,	100 00
Charles H. Tyler,	250 00	Franklin Dexter,	100 00
John L. Saltonstall,	250 00	Harold J. Coolidge,	100 00
Robert S. Bradley,	250 00	Mrs. John A. Burnham,	100 00
Francis Bartlett,	250 00	Mrs. E. P. Motley,	100 00
William Endicott,	250 00	The Misses Paine,	100 00
Alexander Cochrane,	250 00	A. Shuman,	100 00
Amory A. Lawrence,	250 00	Augustus P. Loring,	100 00
Henry F. Sears,	250 00	Miss Frances R. Morse,	100 00
Herbert M. Sears,	250 00	The Misses Loring,	100 00
Miss Fannie P. Mason,	250 00	Mrs. G. H. Shaw,	100 00
Frederick Ayer,	250 00	George A. Goddard,	100 00
Robert Saltonstall,	250 00	Bryce J. Allan,	100 00
Estate of Quincy A. Shaw,	250 00	Col. C. L. Peirson,	100 00
D. Herbert Hostetter,	250 00	Messrs. A. B. and T. Silsbee,	100 00
Henry Clay Peirce,	250 00	Mrs. James F. Curtis,	100 00
Mrs. H. P. McKean,	250 00	Frederick R. Sears,	100 00
Chas. H. Tweed,	250 00	Miss Katherine Silsbee,	100 00
William Phillips,	250 00	Hon. Geo. H. Lyman,	100 00
F. L. Higginson,	250 00	Mrs. John C. Phillips,	100 00
Wm. A. Slater,	250 00	Mrs. Guy Norman,	100 00
Oliver Ames,	250 00	Horace D. Chapin,	50 00
Charles D. Sias,	250 00	C. K. Cummings,	50 00
Wm. D. Sohier,	250 00	O. W. Holmes,	50 00
Thos. P. Beal,	200 00	James L. Paine,	50 00
Cranmore N. Wallace,	200 00	Gordon Dexter,	50 00
W. B. Thomas,	200 00	Mrs. F. H. Peabody,	50 00
Neal Rantoul,	200 00	T. C. Hollander,	50 00
S. Reed Anthony,	200 00	A. C. Ratshesky,	25 00
Mrs. N. W. Rice,	200 00		
Henry P. King,	200 00		$15,150 00

Manchester.

Charles E. Cotting,	$500 00	T. Dennie Boardman,	$100 00
George R. White,	500 00	Thomas B. Gannett,	100 00
George N. Black,	500 00	Richard H. Dana,	100 00
Mrs. R. C. Winthrop,	250 00	Executors of Myron C. Wick,	100 00
Mrs. Chas. S. Hanks,	250 00	T. Jefferson Coolidge,	100 00
George Wigglesworth,	250 00	William Hooper,	100 00
Gordon Abbott,	250 00	Amory Eliot,	100 00
Edward S. Grew,	250 00	J. L. Thorndike,	100 00
Henry L. Higginson,	250 00	S. Parker Bremer,	100 00
Gardiner M. Lane,	250 00	Richard Stone,	50 00
Wm. B. Walker,	250 00	Mrs. Geo. D. Howe,	50 00
Mrs. Henry S. Grew,	250 00	The Misses Bartlett,	50 00
Mrs. James McMillan,	250 00	Roland C. Lincoln,	50 00
Lester Leland,	250 00	Mrs. S. V. R. Crosby,	50 00
Walter D. Denegre,	250 00	The Misses Sturgis,	50 00
Harrison K. Caner,	250 00	William L. Putnam,	50 00
Mrs. W. Scott Fitz,	250 00	Alex. S. Porter, Jr.,	50 00
Francis M. Whitehouse,	250 00	Mrs. Greeley S. Curtis,	50 00
Mrs. Mary L. Blake,	200 00	Wm. A. Tucker,	50 00
Mrs. J. L. Bremer,	200 00	Mrs. James T. Fields,	25 00
T. Jefferson Coolidge, Jr.,	200 00	Russell Tyson,	25 00
Miss Amy Curtis,	200 00	Nelson S. Bartlett,	25 00
Mrs. Charles P. Hemenway,	150 00	J. H. Storer,	10 00
Robt. T. Paine, 2d,	150 00	Lee, Higginson & Co. (various contributions),	299 16
Samuel Carr,	100 00		
Dr. R. H. Fitz,	100 00		
S. H. Fessenden,	100 00	Total,	$8,434 16

Magnolia.

John Hays Hammond,	$500 00	Mrs. R. McM. Colfelt,	$100 00
John T. Morse, Jr.,	400 00	George A. Upton,	75 00
Wm. H. Coolidge,	250 00	George E. Carter,	50 00
Miss E. G. Houghton,	250 00	Mrs. Charles H. Bull,	50 00
Miss Faulkner,	200 00	Mrs. D. P. Williams,	50 00
Oceanside Hotel,	200 00	Mrs. I. Theodore Heard,	50 00
George F. Willett,	200 00	Charles S. Penhallow,	25 00
James S. Lee,	150 00	Georgina Lowell,	25 00
Edward C. Richardson,	100 00	Mrs. A. S. Covell,	10 00
William R. Nelson,	100 00		
J. Harrington Walker,	100 00	Total,	$2,985 00
Mrs. Mary D. Turnbull,	100 00		

Wood Roads.

Miss Mary Curtis,	$25 00

South Shore Work.

Last spring it was thought that the towns and summer residents on the South Shore were to co-operate with the State, and carry on moth work similar to that in vogue on the North Shore for some years. In anticipation of this plan Mr. Walter F. Holmes,

The tree on the left is a sugar maple on a residential street, showing injury from teams and resultant decay. The tree on the right is the same, after treatment. The inside was hollow, but was filled from the two openings.

who has had much experience in the latter place, was transferred to Cohasset to superintend the work. For some reason the plans fell through, but it was thought best to keep Mr. Holmes in that section, and a new division was made there. From the year's work it is believed that the conditions are better than ever, although the results would have been much more satisfactory had the former arrangements been carried out.

City Forester.

The proper care of shade trees in our cities and towns is an economic question of great importance. While trees grow naturally throughout the State, and in the past they have needed little care, in recent years, due to many causes, they must be intelligently looked after if we expect to keep them healthy and vigorous. The importance of foreign depredations like insects and diseases has necessitated our having a knowledge of their habits and life histories as well as remedies for their control. The unbalancing of our conditions in cutting off forests, enlarging our cities and changing things generally in our development of the country are accountable for many of our troubles. The work of the Massachusetts Forestry Association, through its new endeavors in establishing branch organizations in different sections of the State and thereby stirring up new interest in the importance of better care of our trees, is resulting in the desire on the part of our people that more skill be employed. Secretary Reynolds has several competent men working in different sections along this line whose efforts are already showing good results.

Mr. W. W. Colton, a former employee of this department, has been city forester of the city of Fitchburg for the past two years, and as his accomplishments during this time have been extremely effective, I have prevailed upon him to prepare the following paper, believing it will prove of general interest: —

Work of a City Forester in Massachusetts.

Most of our Massachusetts cities have had some individual or some department that has looked after the interests of the shade trees. A few have had a man who held the office of city forester, but whose duties were only to trim and plant shade trees. The gradual change in conditions in the past few years added many duties to the office of city forester, until now it is a much more difficult position to fill than previously. The modern

city forester must be a man of special training, equipped to handle not only the old work but all the forestry and arboricultural interests of his city, such as establishing a nursery in which to raise the trees to plant his streets with, looking after the health and preservation of the older trees of the city, and being able to advise the citizens about their properties from a commercial as well as an æsthetic standpoint, and establishing and maintaining a municipal forest, the products of which will help run his department.

At the present time, however, the chief duty of a city forester is the care of shade trees. In taking over the position of forester in any city, the first duty is to obtain information in regard to his city and the condition of the trees there. To accomplish this he should first of all take a tree census, *i.e.*, all trees standing on public streets should be listed and a record of same kept at a central office for future reference. This work should be done as far as possible personally, as it gives him the personal acquaintance with his trees and their surroundings. After this information has been tabulated, and the forester has made himself familiar with his surroundings, his next step should be to get into the real work of putting the old trees into better condition, removing worthless specimens, and replacing and adding new trees to the streets. He should first of all obtain the services of a good active man of considerable experience in tree work to act as foreman, and then through this foreman put his own ideas into practice.

The question is often asked, "Why is it necessary to have a city forester at all? Why do we need to spend so much money on our shade trees? Cannot they take care of themselves as they have for centuries, without the necessity of having a high-salaried official to look after them? Our trees looked better twenty years ago, and with less care than they now have. Why is it?"

The answer is plain to one versed in the progress of modern events. Our entire mode of living has changed in the past half century; we live faster, we require more in everything. We are not satisfied with what we have been blessed with naturally but we wish for everything that we see others have. This same holds true about trees. We have not been satisfied with the species we find growing here naturally. We wish for some we have seen in Europe, Japan or China. This is only natural; it simply coincides with the progress of things in every branch of life. To satisfy this we have imported foreign trees, shrubs and flowers, and with these foreign plants we have also imported foreign diseases, which in their native countries are not fatal, as nature has there established a balance, and created parasites which in turn keep the pests down and preserve the trees. This sudden change, however, of the insect or disease from one climate to another often kills the parasite, or it is not imported, while the disease itself enters and becomes fatal to our trees. This accounts for practically all of our worst tree pests. The gypsy moth, brown-tail moth,

elm-leaf beetle, San José scale, leopard moth, probably chestnut blight disease and others have all been imported from some foreign country through our greed to have everything that some one else possesses.

The insect problem, nevertheless, has in a way been a benefit to us. It has brought to the notice of the people in general, through actual experience, the fact that a city or town without shade trees is a pretty poor place to live in. It has made them observe their trees, and has caused certain people to awake to the fact that trees, like any other living thing, cannot be set down in artificial conditions and expected to live on forever without some kind of nourishment and care.

There are a number of other items that enter into the cause of decline of our shade trees in the past quarter century, and especially so in our cities. The shade tree in most of our modern cities has a very hard life to live. Practically all the conditions under which it is forced to grow are entirely foreign to its natural element. The soil usually is not as good; it has in most cases been impoverished by continued use for agricultural purposes before it was cut up into building lots. In many cases the land has been made by filling in with ashes, stones and other refuse. In other cases the rich top soil has been removed to enable a grade to be established, the tree being set out originally in poor soil and handicapped from the very start. To add to this handicap, the atmospheric conditions are much different from what they used to be. The air is full of smoke, dust from oiled streets and noxious gases from various manufacturing plants. All these choke the lungs of the tree (its leaves) and cut off its supply of pure air. Add to this the fact that its roots are cut off when the road is regraded, again when the sidewalk is put in; that a tar or cement sidewalk and a macadam or paved street is put in around its roots and its water supply cut off. Then what chance has the poor tree of living?

To meet all these conditions the tree has to change its way of growing many times, and becomes almost an entirely different tree from the same species growing under natural conditions. Some species are not capable of doing this, and will therefore die and have to be removed. It has become necessary for us therefore to make a study of the species most capable of living under these adverse conditions and to replace the less desirable ones with these.

When a tree has all it can do to obtain nourishment enough to live on, it does not take much of a setback to allow the entrance of some disease, which once started quickly weakens the tree, allowing other diseases to take hold, which, combined, quickly prove fatal.

The familiar stag-headed effect, *i.e.*, the top of the trees dying, leaving only the lower limbs alive and green, is caused in most cases from lack of nourishment and moisture. This lack of moisture is not always caused from the absence of the proper elements in the soil, but from the weakening of the tree to such an extent that it is unable to assimilate it. The past few very dry summers have had their effect on the shade trees of all localities, and especially so with us on account of our topography. The dry,

hot summer has almost stopped growth in the tree, and then the fall rains have stimulated a late addition of cells which have not had time to properly harden off before the extreme cold weather has set in. This has caused a severe case of winterkilling of these new cells, resulting in the death of portions of the roots, thereby cutting down their ability to supply food to the tree and resulting in turn in the dying of the tops.

This condition has repeated itself, for several years and is, of course, something that cannot be helped, but the resulting condition of the trees can be aided by the proper care.

These are things liable to happen to perfectly healthy trees and those that have had the best of care, but in the case of the trees where no care has been taken, we find them to be in very poor condition to withstand it.

To give a concrete example of what may be accomplished along these lines, I am going to tell you what we have done in a small way here in Fitchburg.

In the tree directory kept by the city forestry department, it is shown that we have 1,937 trees belonging to the city or within the limits of the highway boundaries in the city proper. Of this number, 254 only are classed as perfect tops and 420 are perfect trunks, 577 are good tops and 597 good trunks, while 1,086 tops and 896 trunks are below that classed as poor or in bad condition.

Of the same number of trees we find the following defects present: 166 have cavities of more or less size which need tinning or cementing to keep the gypsy moth out and to prevent fungous diseases from entering; 26 have crotches or bad forks that need bracing by means of bolts or chains to ensure them against splitting; 180 have injuries of a more or less serious nature that need attention; 42 have boiler plate guards that are now injuring the trees and should be removed; 115 have wire guards that have been imbedded in the growing tree until they are girdling and killing it. Of the entire number of street trees only 289 have guards of any kind, and 173 of these need removing, so that practically all of our shade trees that stand near the curbing need new wire guards. Besides this work, many of the trees listed as dying or in poor or bad condition are in need of rejuvenation.

To give an illustration to the people of our city of what could and should be done with all shade trees in the city, the local branch of the Massachusetts Forestry Association made available a sum of money for our department which they stipulated was to be used on a certain street to put the trees there in the best possible condition under the circumstances.

A street was picked out that was centrally located and on which there were 29 trees, ranging in diameter from 15 to 25 inches and composed of 21 sugar maples, 6 American elms, 1 horse chestnut and 1 American linden. Not one of these trees was classified in our census as perfect, but a majority of them was in good or fair condition and 7 of them were in poor condition.

It was our aim to put all these trees in such condition that we could reclassify them as very good or perfect.

In order to do this we removed all the dead or dying limbs, cut off superfluous branches, and shaped the tree so that it would conform with its

neighbors as near as possible; chained together limbs that were in danger of splitting off in a heavy wind storm; removed the boiler plates and old wire guards that had outgrown their usefulness; opened up all cavities, cleaned out all the dead wood and refilled them; and lastly, removed the curbing and sidewalk that were choking the root and trunk growth of the tree, and put on new guards.

The first operation of removing the dead limbs is a very simple one, and one that every one has seen done many times. In this, however, and also when we remove the live limbs, great care is taken to make the cut as close to the trunk of the tree as possible, and to have it cut parallel to the axis of the tree. After the cut is made the resulting wound is carefully covered with tar, to prevent water and air from getting into the freshly exposed wood and starting decay anew.

The shaping of the tree is something that has to be left to the judgment of the foreman, as the conditions under which the tree is growing enter into the case very largely, and no set rule can be laid down.

After the tree has been relieved of its dead wood, and enough live wood removed to shape it as wanted, all the remaining limbs are carefully looked over for defects. If we find any cavities in them they are scraped out and cement put in, or the inside treated with creosote and then a piece of zinc or tin cut to exactly fit this hole and nailed over it, after being tarred on both sides to prevent the moisture from the live wood rusting it. If the limb is particularly weakened after the dead tissue is removed, then cement is usually used instead of tin, as this adds strength to the limb.

In many cases these limbs where they leave the main body of the tree are particularly weak (some have already started to crack), and show to the expert eye that they need bracing, in order to prevent them from splitting off during some wild storm and possibly injuring some passer-by, thereby causing not only inconvenience to some of our citizens but also the danger of the added expense of a lawsuit to the city. In order to prevent this, when we find a limb that in our opinion is dangerous it is braced by means of chains connecting it with some other stronger limb or with the main trunk. These chains are attached to the tree or limb by means of bolts or lugs set into the wood, and the chain attached to the bolts and not to the tree itself. This has the effect of holding the limbs in the position they are meant to assume, and yet it does not prevent them from swinging in the wind to some extent.

The old boiler plates and wire guards that were once attached to the trunks of the trees have in most cases long since passed their usefulness and now need to be removed. In the case of the wire guards, they were firmly nailed to the trunk of the tree, and as the tree has continued to grow the wire has naturally remained stationary, and therefore has become imbedded in the living tissue of the trunk. This has to be removed, or the tree stands in danger of being girdled or of being injured to such an extent that fungous and other diseases can find a lodgment and form new cavities. This same has been true, to a certain extent, with the boiler plate guards; they have become imbedded in the tree oftentimes

to such an extent that it is almost impossible to remove them. In addition to this trouble we have the danger of water settling behind these guards and causing serious decay; it is also an ideal lodging place for insects of all kinds, especially the gypsy moth. All these guards have been removed, and where it was found necessary the cavities behind them treated in the proper manner.

The method used in treating all the cavities was to remove every sign of decayed and decaying wood; then in case of a large cavity staples are driven into the wood near the edge of the wound and a wire screen cut to fit the opening fastened into place. A small space is reserved at the top, through which the first installment of cement is poured, this consists of a composition of cement, sand and coarse gravel. After this has set, the outside dressing of fine cement and sand is applied and the finishing touches are added. Great care has to be taken here not to have the cement overlap the cambium layer or growing part of the tree. After this has thoroughly set the whole thing is painted with tar. Before the cement is run into the hole, the wood is treated with creosote, to prevent its attack by the fungous ant, and to kill any that may not have been reached when the dead wood was being removed.

The last operation that we have had to do in the case of these trees is to place new wire guards around them, to remove the curbing where it is pressing too close to the tree and to remove the sidewalk for a given number of square inches around its base. From this place all the cobblestones and other refuse that have been used in construction of the sidewalk is removed and a fresh supply of loam put in its place. This gives the tree a chance to expand and grow, and a chance for a small amount of water and air to penetrate the earth. As a tree needs both of these elements for its continued health, we have done just so much more towards its accomplishment, and probably added several years of life to these trees.

All this work not only prolongs the life of the trees themselves but adds to the health and beauty of this street. Trees are not only beautiful to look at (when properly cared for), and an addition to any street, but are in themselves an addition to the health of that street, as they take up carbon dioxide and other noxious gases from the air, and after breaking this up and absorbing the carbon to make cellulose for their own tissue building, they give back to the atmosphere pure oxygen. They are also great equalizers of temperature, making it warmer in winter and cooler in summer, because of the great amount of water transpired through their leaves and cells. They are a benefit to the city which takes good care of them because they attract outsiders, and often are the cause of bringing new industries to your city.

So much for the shade-tree problem of a city forester. Besides this so-called tree surgery work, there are a number of diseases and insect pests to be handled and preventive methods used in caring for them.

Where the elm-leaf beetle is established, or where gypsy or brown-tail moths have obtained a foothold, a power sprayer outfit is very essential,

A large cavity filled with cement and cobble stones, forming a cheap and serviceable filling.

Cavity in old apple tree cleaned out and covered with zinc. A hiding place for the gypsy moth closed. Note the new growth of one season covering the edges.

and a well-defined spraying campaign should be carried out from early spring, when it is advisable to spray for scale insects, until August, when the most effective work can be accomplished against the brown-tail.

In carrying on the work against the gypsy moth, we divide it into two divisions, orchard and woodland work, each of which has its separate methods of procedure and is in turn divided into three classes of work.

Of course, the first object is to get the owner to do his own work and do it intelligently, but where this cannot be accomplished, we take the following method. If it be an orchard, our first work is to remove the worthless trees and then put the remaining ones in the best possible condition to withstand the pests. This can be done by removing the dead wood and closing all cavities within by means of the tin or zinc method, or cement. There are several methods of cementing which are cheaper but not as lasting as the ones described previously. A picture of one method is shown in this report. The large cavity is simply hurriedly cleaned of decayed matter and the outside edges pared down to give a free exposure of the cambium, then the cavity is filled with a composition of cement, sand and large stones, care being taken, of course, not to remove the cement composition over the cambium layer. The whole thing is then painted with tar. This affords a cheap filling for large cavities and at the same time prevents the laying of eggs out of sight or where they cannot be easily treated. Smaller cavities are treated as illustrated elsewhere in this report.

After the orchard has been put into this condition the owner is instructed to hunt the eggs of the gypsy moth and treat them with creosote, or the city does the work.

Owing to the topography of our city, and the great amount of loose stones, retaining walls and old stone walls, it is impossible to locate and treat all the egg clusters deposited, and a continuous infestation is therefore resulting, in spite of the elimination of the hollow trees. It therefore becomes necessary to use other means of holding them in check. For this reason spraying of orchards is advised, and the additional use of tanglefoot on the trees where they adjoin woodland infested with gypsy moths.

In the case of woodland, we advise also the removal of worthless specimens, or, in other words, an improvement thinning adapted to gypsy moth conditions. For this purpose we have published a list of trees which are more or less resistant to the gypsy moth and those nonresistant. It is then our policy in every case possible to remove not only suppressed and worthless trees, but also the nonresistant species.

Two examples of this work we conducted in our city last year. The first covered an area of about 6 acres and the second 50 acres. In the first case the work was done at a profit to the owner of some $200, and in the second case, where a considerable area of pine thinnings was made also, a profit of $1,300 was realized.

In the second stage of work in the case of woodland it does not seem profitable to go over the trees with creosote or use the tanglefoot only in rare instances, but spraying is conducted extensively.

In addition to the above-stated methods, which I designate as hand methods, we are relying mostly for the controlling of the gypsy moths in the wood on the free use of diseases and parasites. In this latter method is our only hope for the future in controlling the pests.

In conclusion, I would say that I believe one of the important duties of the forester in cities of Massachusetts where we have such narrow streets is to see that through proper co-operation with land companies and the city departments the future plans for improvements on streets and the laying out of new ones should give attention to the establishing of a space for shade trees between the curb and the sidewalk. This gives a much more satisfactory effect and uniformity of planting to street trees, and at the same time affords the tree a much better chance of thriving than under the present conditions, where they are oftentimes placed partly in the street and partly in the sidewalk, or, in some cases, in the very middle of the sidewalk itself.

As shade trees have been proved to be a distinct addition to a city, together with increasing the value of property abutting, it would seem to be a good investment for any city or group of towns to employ the services of a trained forester, who can look after their interests not alone in regard to shade trees, but for the establishment of municipal forests for a future revenue.

Lectures and Addresses.

The State Forester has had the usual number of requests for engagements in the State and abroad, but his time has been so fully taken up that it has been impossible to do as much of this work as usual throughout the year.

The usual lectures on the State forest policy were given before the students at the Massachusetts Agricultural College during the winter.

The following organizations were addressed during the year: —

West Hampden Pomona Grange.
Norfolk Men's Association.
Worcester Horticultural Society.
Chicopee Board of Trade.
Men's Club, Hopedale.
Aberdeen Club.
Needham Farmers and Mechanics Club.
New Century Club, Mansfield.
Massachusetts Forestry Association.
Springfield Fish and Game Club.
Young Men's Christian Union.
State Board of Agriculture.
Taxation Convention.
District Fire Meeting, Walpole.
Economic Club.
Cape Ann Scientific and Literary Association.
Farmers' Institute, Warwick.
Massachusetts Agricultural College.
Chestnut Blight Convention, Harrisburg, Pa.
Boston Market Gardeners' Association.
St. James Men's Club, Roxbury.
Berkshire Public Lecture, Pittsfield.
Natural History Museum, Science Teachers.

One of the many trees in need of immediate attention.

Properly pruning and treating a street tree (elm). Trimming crew at top of 36-foot ladder; foreman at foot.

Pomona Grange, Medway.
Canton Lecture Course.
Fitchburg City Government.
Newton Men's Club.
Northfield Grange.
Grange, Southborough.
Amesbury Park Association.
Norfolk County Associated Board of Trade.
Public Meeting, Great Barrington.
Old Colony Pomona Grange, Easton.
State Grange Field Day, Monterey.
Old Colony Pomona, Dartmouth.
Cape Ann Literary and Scientific Society, Gloucester.
State Grange Field Day, Montague.
Pomona Grange, Billerica.
Men's Club, Hopedale.
Citizens' Meeting, Carver.
Firemen's Muster, Hanover.
State Grange Field Day, Pembroke.
Arbor Day Exercises, Winthrop.
State Grange Field Day, Templeton.
New England Tax Association.

Field Meetings of the State Grange.

No more potent factor exists for the uplift of humanity and the promotion and advancement of all contributory agencies to material prosperity in rural communities than the work of the order known throughout the country as the Patrons of Husbandry. Nearly every town and village in Massachusetts has its grange hall, where at stated intervals the members of the order gather and discuss questions of importance relating to the welfare of the nation, State or their local communities. The objects of the order are to aid in the development of everything which may add to the wealth and power of the nation, and bring to its people the fullest measure of comfort and happiness. In order to stimulate the interest of its members in all movements for the betterment of economic conditions in Massachusetts, the State master, Charles M. Gardner, this year arranged for and held a series of field meetings that were addressed by representatives of various State departments, each of whom spoke in detail of the work of his department. The State Forester's office was represented by the secretary, Charles O. Bailey, at the meetings held at Pembroke, Greenwich Village, Montague, Templeton, Monterey, Blandford, Sunderland and Dartmouth. The work of reforestation, the development of the forest fire system, and other branches of forestry were discussed by the speaker, and the decidedly marked interest manifested by the audience at each meeting was extremely gratifying, and must be regarded as an indication of the enthusiastic favor with which the forestry movement is held generally by the people of the Commonwealth.

Fourth National Conservation Congress.

The Fourth National Conservation Congress met at Indianapolis, Ind., October 1 to 4, and the State Forester was appointed a delegate by Governor Foss.

The Congress was a success, and from the forestry standpoint interest was aroused that promises for even greater accomplishments at future meetings. The lumbermen were well represented. Many of the State officials in forestry lines were present, and the work along forest fire protection and management was fully discussed.

While at this convention I was particularly fortunate in having an opportunity to go over the data accumulated by the Indiana State Forester relating to the catalpa tree. This tree is indigenous to Indiana. There has been so much written about it as being a tree well adapted to general forestry uses, particularly the *catalpa speciosa*, that I was pleased to obtain information I have much wished for. I find that this species, even in Indiana, is not considered commercially as valuable as many would make it. This corroborates our experience thus far with the catalpa in Massachusetts. We have several examples where the catalpa plantations have proved a failure.

Meeting of Eastern Foresters.

A meeting of the organization known as the Eastern Foresters, which is composed of the State officials and others engaged in teaching or professional forestry work in the eastern States, was held July 15 and 16 at Petersham, Mass., at the invitation of Professor Fisher of the Harvard Forest School. It proved to be the largest gathering ever held of the members, and the occasion gave an opportunity to study the Harvard forestry school methods and discuss State forest policies.

Financial Statements.

General Forestry.

In accordance with section 6, chapter 409 of the Acts of 1904, as amended by section 1, chapter 473 of the Acts of 1907, the following statement is given of the forestry expenditures for the year ending Nov. 30, 1912: —

Salaries of assistants,	$5,611 42
Traveling expenses,	1,431 85
Stationery, postage and other office supplies,	1,191 79
Printing,	461 57
Nursery account,	5,270 57
Sundries,	29 44
	$13,996 64

Reforestation.

Labor,	$6,042 22
Land,	1,250 90
Trees,	619 88
Tools and equipment,	350 83
Travel,	1,162 07
Express,	491 34
Sundries,	73 05
	$9,990 29

Forest Fire Prevention.

Salaries,	$5,341 14
Travel,	1,591 22
Printing,	1,066 85
Stationery, postage and other office supplies,	339 07
Express,	68 59
Equipment,	1,115 22
Construction,	814 88
Telephone,	322 70
Sundries,	5 74
	$10,665 41

Miscellaneous.

Salaries,	$5,095 46
Travel,	2,726 00
Printing,	168 24
Stationery, postage, and other office supplies,	128 29
Express,	102 35
Equipment,	257 51
Construction,	372 49
Telephone,	482 36
Sundries,	1 63
	$9,334 33

Reimbursement to towns for fire-fighting apparatus $4,989.99.

Moth Work.

The balance shown on the general appropriation for suppression work will be greatly reduced by reimbursements to cities and towns which have not yet made returns to this office of their final expenses for the year.

GENERAL APPROPRIATION.

Balance on hand Nov. 30, 1911,	$116,103 44	
Less reimbursement due for 1911,	68,661 37	
Balance for 1912 work,	$47,442 07	
Receipts: —		
Appropriation for 1912,	150,000 00	
Town of Natick,	479 77	
Town of Great Barrington,	157 00	
Town of Rowley,	619 28	
Town of Norwell,	179 73	
Town of Hingham,	10 48	
Appropriation of Feb. 20, 1912,	100,000 00	
Town of Milton,	2,510 34	
Town of Wakefield,	658 37	
Town of Rockport,	126 95	
Town of Needham,	432 52	
Boston Brick Company,	526 89	
Transfer forest fire appropriation,	16 47	
Transfer forestry appropriation,	43 28	
Transfer reforestation appropriation,	215 49	
Transfer special North Shore fund,	14,389 08	
Transfer special South Shore fund,	16 49	
City of Marlborough,	679 25	
Chas. H. Chaplin for wood,	33 00	
Miss M. R. Case for work in Weston,	211 90	
Town of Topsfield,	559 61	
J. D. Barnes,	30 00	
		$319,337 97
Office expenses: —		
Salaries of clerks,	$2,598 91	
Rent of offices,	2,621 66	
Stationery and postage,	945 12	
Printing,	1,566 93	
Office and laboratory supplies,	653 21	
Office and laboratory sundries,	714 30	
Amounts carried forward,	$9,100 13	$319,337 97

Amounts brought forward,	$9,100 13	$319,337 97
Field expenses: —		
Wages of employees,	29,777 19	
Traveling expenses,	12,513 31	
Tools and supplies,	107,281 22	
Special work,	17,500 00	
Rent of supply store,	745 83	
Rent of shop,	250 00	
Equipment at store,	185 47	
Sundries, including teaming,	3,467 65	
Reimbursement to towns and cities,	35,343 17	
		216,163 97
Balance,		$103,174 00
Appropriation for 1913,		75,000 00
Balance on hand Nov. 30, 1912,		$178,174 00
Reimbursement for 1912, paid in December, 1912, and January, 1913,		61,016 06
Balance carried to 1913, for year 1913, including $75,000 appropriated in 1912,		$117,157 94

Special North Shore Fund.

Receipts.

Balance from 1911,	$1,412 46	
Deposit by F. W. Rane, State Forester,	5,000 00	
Deposit by W. D. Sohier, agent,	5,000 00	
Deposit by city of Beverly,	5,000 00	
Deposit by W. D. Sohier, agent,	5,000 00	
Deposit by town of Manchester,	5,000 00	
Deposit by W. D. Sohier, agent,	5,000 00	
Deposit by F. W. Rane, State Forester,	12,500 00	
Deposit by W. D. Sohier, agent,	2,500 00	
Cash received for work on private estates,	5,147 30	
		$51,559 76

Expenditures.

Wages of employees,	$29,319 56	
Traveling expenses,	1,289 36	
Rent,	221 00	
Supplies,	14,930 81	
Stationery and postage,	7 95	
Sundries, including teaming, etc.,	2,109 03	
		47,877 71
Balance on hand Nov. 30, 1912,		$3,682 05

SPECIAL SOUTH SHORE FUND.

Receipts.

Balance from 1911,	$107 68

Expenditures.

Field supplies,	$16 49	
Field sundries,	25 00	
		41 49
Balance on hand Nov. 30, 1912,		$66 19

The following is a list of towns and cities, with amount of supplies for moth work furnished for the year ending Nov. 30, 1912: —

Acton,	$302 77	Halifax,	$7 31
Andover,[1]	2,543 15	Hamilton,	800 81
Arlington,	1,306 03	Hanover,[1]	2,026 04
Ashburnham,	32 64	Hanson,	137 54
Ashby,	52 45	Harvard,	439 66
Ashland,	87 49	Hingham,	1,240 35
Avon,	59 65	Holden,	72
Bedford,	1,801 59	Hopkinton,	58 82
Berkley,	21 48	Hubbardston,	19 26
Berlin,	68 96	Hudson,	81 23
Billerica,	458 23	Ipswich,[1]	2,300 70
Bolton,	139 55	Kingston,[1]	1,091 69
Boston,	7 20	Lancaster,	51
Boxborough,	318 55	Lenox,	72
Boxford,	212 00	Lexington,	1,425 61
Boylston,	28 74	Lincoln,	1,989 13
Burlington,	410 47	Littleton,	279 55
Canton,	1,408 56	Lowell,	22 14
Carlisle,	525 62	Lunenburg,	142 98
Carver,[1]	1,099 10	Lynn,[1]	1,361 72
Chelmsford,	650 92	Lynnfield,[1]	2,489 82
Cohasset,[1]	3,446 51	Marlborough,[1]	1,596 23
Concord,	1,014 57	Marshfield,[1]	2,356 49
Danvers,	447 46	Mashpee,	56 87
Dracut,[1]	1,851 12	Medford,	1,223 62
Dunstable,	122 43	Merrimac,	129 91
Duxbury,[1]	1,034 02	Methuen,	767 24
East Bridgewater,	6 43	Middleborough,	279 16
Easton,[1]	1,658 40	Middleton,	275 59
Essex,	95 55	Milton,	2,673 78
Fitchburg,	3 24	Natick,	48 15
Georgetown,	504 41	Newbury,[1]	2,181 07
Gloucester,	767 33	Newton,[1]	7,332 99
Great Barrington,	72	Norfolk,	176 97
Groton,[1]	2,033 58	North Andover,	655 34
Groveland,	154 80	North Reading,	974 30

[1] Received sprayers from the State, agreeing to pay one-half the cost.

Northborough,	$56 50	Stoughton,	$0 86
Norwell,	660 68	Stow,	227 12
Paxton,	6 84	Sudbury, [1]	1,978 38
Pembroke,	148 66	Tewksbury, [1]	1,994 84
Pepperell, [1]	1,895 23	Topsfield,	433 16
Phillipston,	6 84	Townsend, [1]	1,782 00
Plympton,	76 55	Tyngsborough,	187 35
Princeton,	18 54	Wakefield,	959 48
Quincy,	1,225 11	Walpole, [1]	1,629 76
Raynham,	25 67	Waltham, [1]	3,189 22
Reading,	1,569 93	Wayland, [1]	2,629 30
Rockport,	16 18	Wenham,	991 63
Rowley,	1,180 71	West Bridgewater, [1]	1,752 33
Royalston,	23 80	West Newbury,	303 80
Salisbury,	203 24	Westborough,	13 76
Sandwich,	34 10	Westford,	465 57
Saugus,	1,599 57	Westminster,	16 72
Scituate,	1,749 02	Weston,	2,618 95
Sherborn,	385 03	Westwood, [1]	1,628 30
Shirley, [1]	1,936 42	Wilmington,	1,017 18
Shrewsbury,	2 61	Winchester, [1]	1,970 77
Southborough,	237 10	Woburn,	1,290 31
Sterling,	1,675 31		
Stoneham, [1]	2,176 34		$105,310 51

Cities and towns,	$105,402 33
Experimental work,	23 77
Forestry department,	43 28
Forest fire prevention,	16 47
Malden Hospital,	29 50
North Shore fund,	16,389 08
Pine Banks,	159 43
Reforestation,	215 49
South Shore fund,	16 49
Traveling pump,	5 82
Traveling sprayer, (1),	21 56
Traveling sprayer, (2),	1 25
Traveling sprayer, (3),	54 33
Traveling sprayer, (4),	226 58
Traveling sprayer, (5),	13 53
Traveling sprayer, (6),	50 14
Traveling sprayer, (7),	172 32
United States Department of Agriculture,	34 65
	$122,784 20

Financial Summary by Towns of Moth Work.

The following table shows the reimbursement paid to cities and towns for the year 1911, the total net expenditure, the required expenditure before receiving reimbursement from the State, the amount of work on private property returned to this office, and the amount of reimbursement paid for 1912, with the required expenditure for 1913.

[1] Received sprayers from the State, agreeing to pay one-half the cost.

Towns and cities having an asterisk (*) against the amount of reimbursement for 1911 and 1912 also received supplies from the State supply store, as per list printed on page 87 in annual report for 1911 and on page 98 in this year's report.

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Abington,	–	$1,311 93	–	–	–	$1,361 05
Acton,	$1,002 88*	915 40	$1,913 25	$332 50	$997 85*	970 13
Acushnet,	–	382 38	–	–	–	402 86
Amesbury,	–	2,546 82	2,144 22	891 23	–	2,615 03
Andover,	759 87*	2,873 89	3,455 40	1,670 38	–*	2,883 11
Arlington,	21 81*	5,000 00	4,070 37	1,770 98	–*	5,000 00
Ashburnham,	–*	421 21	525 96	325 81	104 75*	488 17
Ashby,	232 33*	232 92	466 40	69 16	233 48*	239 32
Ashland,	69 13*	515 79	759 57	173 12	243 78*	585 00
Athol,	–	1,967 57	–	–	–	2,216 99
Attleborough,	–	5,000 00	–	–	–	5,000 00
Auburn,	–	537 60	–	–	–	554 00
Avon,	67 17*	396 94	518 96	108 71	122 02*	414 70
Ayer,	–	890 99	844 26	31 70	–	922 45
Barnstable,	–	3,150 59	–	–	–	3,175 20
Barre,	–	910 96	–	–	–	1,001 02
Bedford,	2,464 26*	600 77	2,897 57	1,886 33	2,296 80*	667 80
Bellingham,	–	373 67	–	–	–	383 65
Belmont,	572 26*	2,757 03	1,832 61	1,576 00	–	3,015 78
Berkley,	–	162 46	259 68	47 87	97 22*	165 77
Berlin,	881 82*	239 68	1,248 95	393 64	1,009 27*	243 10
Beverly,	316 83	5,000 00	4,544 26	1,979 52	–	5,000 00
Billerica,	651 75*	1,025 97	1,880 86	458 01	854 89*	1,132 00
Blackstone,	–	944 55	–	–	–	948 29
Bolton,	237 10*	234 32	1,107 08	114 95	872 76*	258 98
Boston,	20,000 00*	5,000 00	47,851 69	17,817 90	20,000 00*	5,000 00
Bourne,	–	2,277 02	–	–	–	2,881 49
Boxborough,	1,406 11*	114 43	1,436 42	111 36	1,321 99*	116 41
Boxford,	1,684 58*	586 74	2,638 94	329 03	2,052 20*	610 32
Boylston,	–	206 91	210 85[1]	191 70	–*	207 40
Braintree,	–	2,677 95	–	–	–	3,163 39
Brewster,	–	341 88	–	–	–	354 44

[1] No papers filed.

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Bridgewater,	$280 69*	$1,420 72	$1,123 90	$276 42	–	$1,447 26
Brockton,	–	5,000 00	–	–	–	5,000 00
Brookfield,	–	546 68	–	–	–	541 40
Brookline,	–*	5,000 00	–	–	–	5,000 00
Burlington,	2,310 25*	293 94	1,790 52	163 75	$1,496 58*	310 18
Cambridge,	–	5,000 00	–	–	–	5,000 00
Canton,	1,154 91*	2,044 39	2,336 35	1,469 47	291 96*	2,133 36
Carlisle,	2,373 26*	193 85	2,986 10	242 16	2,792 25*	191 37
Carver,	95 66*	808 23	1,623 05	440 24	489 82*	770 99
Charlton,	–*	539 53	–	–	–	522 40
Chelmsford,	464 74*	1,688 17	2,188 88	1,065 73	500 71*	1,753 60
Chelsea,	–	5,000 00	–	–	–	5,000 00
Clinton,	–	3,522 98	2,253 31	–	–	3,632 43
Cohasset,	1,153 29*	3,997 11	6,573 60	2,074 00	1,011 89*	3,802 02
Concord,	1,351 23*	3,088 80	4,724 04	2,469 97	1,105 28*	3,372 27
Danvers,	2,479 43*	2,644 15	4,377 42	1,393 52	1,297 13*	2,792 62
Dedham,	–	5,000 00	–	–	–	5,000 00
Dennis,	–	516 50	–	–	–	530 67
Douglas,	–	542 80	–	–	–	551 50
Dover,	954 89	2,347 82	–[1]	–	–	2,515 57
Dracut,	878 45*	990 92	1,888 24	956 25	297 32*	1,013 87
Dudley,	–	766 99	–	–	–	794 74
Dunstable,	878 77*	193 81	990 52	265 80	796 71*	170 36
Duxbury,	208 03*	948 11	1,530 81	718 42	257 70*	1,268 83
East Bridgewater,	399 63*	897 49	954 03	275 58	56 54*	903 05
Easton,	–	2,395 75	2,725 42	1,141 09	–*	2,403 14
Essex,	850 23*	524 64	1,127 95	418 75	603 31*	496 97
Everett,	–	5,000 00	1,830 06	–	–	5,000 00
Fairhaven,	–	1,509 81	–	–	–	1,554 84
Falmouth,	–	3,604 88	–	–	–	4,718 70
Fitchburg,	–*	5,000 00	–	–	–*	5,000 00
Foxborough,	–	985 74	–	–	–	1,033 04
Framingham,	–	5,000 00	3,444 23	–	–	5,000 00
Franklin,	–	1,731 40	–	–	–	1,773 40
Gardner,	–	3,806 52	–	–	–	4,005 63
Georgetown,	1,516 45*	505 10	1,963 58	678 68	1,458 48*	498 01
Gloucester,	675 33*	5,000 00	9,013 46	2,389 21	1,623 07*	5,000 00

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Grafton,	–	$1,144 11	–	–	–	$1,168 22
Great Barrington,	–	2,509 28	–	–	–*	2,536 84
Greenfield,	–	4,029 76	–	–	–	4,324 33
Groton,	$390 12*	1,588 66	$2,170 36	$451 01	–*	1,645 19
Groveland,	961 44*	487 34	1,407 67	364 74	$920 33*	486 64
Halifax,	431 86*	255 53	693 93	499 55	438 40*	260 10
Hamilton,	734 96*	1,728 38	2,763 91	992 82	1,035 53*	1,874 57
Hanover,	760 18*	622 22	2,080 19	627 78	857 97*	638 09
Hanson,	552 58*	531 87	1,448 23	248 76	916 36*	551 32
Harvard,	1,033 69*	630 22	1,164 00	523 80	533 78*	680 53
Haverhill,	103 28*	5,000 00	4,152 27	1,473 88	–	5,000 00
Hingham,	–*	3,140 99	3,254 23	1,606 43	–*	3,116 37
Holbrook,	–	598 23	–	–	–	639 20
Holden,	–	685 23	–	–	–*	712 78
Holliston,	–	791 74	–	–	–	787 43
Hopedale,	–	1,975 15	–	–	–	2,365 45
Hopkinton,	–	655 65	–[1]	–[1]	–[1]*	702 60
Hubbardston,	–	277 09	–	–	–*	307 48
Hudson,	298 52*	1,589 83	1,839 48	622 93	249 65*	1,618 63
Hull,	–	2,788 01	–	–	–	3,039 23
Ipswich,	1,493 55*	2,257 54	2,831 94	1,185 67	24 40*	2,295 12
Kingston,	495 92*	747 58	1,296 63	463 53	224 05*	660 18
Lakeville,	–	336 06	–	–	–	426 08
Lancaster,	–	1,868 90	–	–	–*	2,140 57
Lawrence,	–	5,000 00	–	–	–	5,000 00
Leicester,	–	976 07	–	–	–	972 41
Lenox,	–	3,065 13	–	–	–*	3,133 87
Leominster,	–*	5,000 00	–	–	–	5,000 00
Lexington,	2,050 34*	3,182 90	6,724 89	1,969 93	2,548 47*	3,242 41
Lincoln,	–*	1,440 09	1,886 36	2,356 19	448 27*	1,615 75
Littleton,	949 82*	459 41	1,336 14	88 80	876 73*	467 68
Lowell,	109 39*	5,000 00	4,133 66	3,439 09	–*	5,000 00
Lunenburg,	661 04*	501 74	1,368 18	692 40	866 44*	534 53
Lynn,	–	5,000 00	1,156 50	3,036 21	–*	5,000 00
Lynnfield,	1,650 93*	437 07	2,226 36	492 98	1,189 29*	479 72
Malden,	–	5,000 00	–	–	–	5,000 00
Manchester,	–	5,000 00	–	–	–	5,000 00

[1] Work financed by State Forester's office.

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Mansfield,	–	$1,797 57	–	–	–	$1,672 18
Marblehead,	–	3,700 69	$2,042 15	$1,446 75	–	4,079 57
Marion,	–	2,187 92	–	–	–	2,065 46
Marlborough,	–	4,139 61	4,341 89[1]	–	–*	4,278 62
Marshfield,	$787 51*	966 60	2,008 77	1,134 17	$442 17*	1,064 55
Mashpee,	876 87*	94 60	845 33	112 67	750 73*	97 38
Mattapoisett,	–	847 83	–	–	–	798 62
Maynard,	–*	1,593 12	–	–	–	1,632 04
Medfield,	–	649 45	–	–	–	676 33
Medford,	–*	5,000 00	5,846 90	2,776 70	–*	5,000 00
Medway,	–	607 47	413 30	144 00	–	636 51
Melrose,	–	5,000 00	2,113 39	369 90	–	5,000 00
Mendon,	–	290 36	–	–	–	275 44
Merrimac,	778 08*	528 80	1,511 11	287 86	982 31*	535 89
Methuen,	59 92*	3,034 46	3,693 23	2,318 04	373 57*	3,194 64
Middleborough,	719 55*	1,916 35	2,609 47	1,296 42	693 12*	1,939 92
Middleton,	946 80*	340 18	1,629 50	290 13	1,289 32*	354 60
Milford,	–	3,812 48	–	–	–	3,954 62
Millbury,	–	1,123 31	–	–	–	1,193 41
Millis,	–	463 75	–	–	–	539 09
Milton,	–*	5,000 00	4,364 28	9,274 71	–*	5,000 00
Nahant,	–	3,543 50	–	–	–	3,673 72
Natick,	–*	3,312 66	2,605 61	2,172 80	–*	3,479 07
Needham,	–*	2,769 37	2,479 97	1,823 48	–	2,926 47
New Bedford,	–	5,000 00	–	–	–	5,000 00
Newbury,	2,342 80*	524 34	2,262 04	655 92	1,137 70*	627 06
Newburyport,	–	5,000 00	–	–	–	5,000 00
Newton,	5,994 96*	5,000 00	17,621 73	18,725 41	2,644 37*	5,000 00
Norfolk,	–	366 28	602 72	230 56	236 44*	418 44
North Andover,	709 22*	2,163 16	–[2]	–	–*	2,211 81
North Attleborough,	–	3,591 39	–	–	–	3,665 74
North Reading,	2,240 51*	299 56	2,228 50	642 86	1,928 94*	354 10
Northborough,	–	557 81	1,347 72	268 78	789 91*	566 66
Northbridge,	–	1,958 94	–	–	–	2,086 30
Norton,	–	555 78	–	–	–	601 74
Norwell,	–*	457 37	860 72	1,461 01	403 35*	446 38
Norwood,	–	5,000 00	–	–	–	5,000 00

[1] No papers filed.

[2] Complete returns not yet filed.

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Oakham,	–	$147 96	–	–	–	$152 32
Orange,	–	1,620 19	–	–	–	1,652 94
Orleans,	–	607 60	–	–	–	765 33
Oxford,	–	797 74	–	–	–	820 58
Palmer,	–	1,887 59	–	–	–	1,934 07
Paxton,	–	155 27	–	–	–*	153 36
Peabody,	–	4,824 90	$6,932 14	$837 89	$1,685 79	5,000 00
Pembroke,	$1,039 19*	383 29	1,749 38	403 54	1,366 09*	390 54
Pepperell,	1,078 70*	923 79	2,004 49	468 35	480 70*	907 45
Petersham,	–	450 91	–	–	–	442 07
Phillipston,	–	116 10	–	–	–*	114 78
Plainville,	–	337 82	–	–	–	342 66
Plymouth,	–	4,720 83	–	–	–	4,886 83
Plympton,	1,246 08*	159 28	1,659 81	237 55	1,500 53*	166 36
Princeton,	–	551 91	–	–	–*	568 21
Provincetown,	–	883 52	–	–	–	915 41
Quincy,	647 75	5,000 00	3,697 12	1,945 64	–*	5,000 00
Randolph,	–	1,033 22	–	–	–	1,092 40
Raynham,	86 50*	318 46	770 57	139 12	452 11*	354 45
Reading,	822 74*	2,537 43	3,459 08	2,415 46	423 33*	2,618 75
Rehoboth,	–	372 53	–	–	–	385 80
Revere,	–	5,000 00	–	–	–	5,000 00
Rochester,	–	290 70	–	–	–	379 92
Rockland,	–	1,765 40	–	–	–	1,931 05
Rockport,	–*	1,464 25	1,910 81	959 00	446 56*	1,512 99
Rowley,	424 70*	1,132 50	1,830 57	134 12	698 07*	968 80
Royalston,	–	282 17	185 21	161 26	–*	278 44
Rutland,	–	318 40	–	–	–	312 59
Salem,	43 25	5,000 00	–	–	–	5,000 00
Salisbury,	1,046 91*	395 21	1,660 50	282 34	1,265 29*	535 99
Sandwich,	150 22*	463 12	620 91	244 12	157 79*	473 83
Saugus,	2,497 56*	2,356 02	5,312 44	1,458 19	2,956 42*	2,537 20
Scituate,	4,199 67*	1,972 23	6,018 60	1,375 00	4,046 37*	2,052 80
Seekonk,	–	566 58	–	–	–	499 89
Sharon,	–	1,284 47	–	–	–	1,287 25
Sherborn,	643 68*	604 25	903 38	895 35	299 13*	644 53
Shirley,	203 93*	491 91	1,127 25	133 80	–*	501 98
Shrewsbury,	–	770 21	–	–	–*	960 50

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Somerville,	–	$5,000 00	–	–	–	$5,000 00
Southborough,	$314 66*	791 73	$1,473 99	$1,045 76	$682 26*	822 60
Spencer,	–	1,412 37	–	–	–	1,459 18
Springfield,	–	5,000 00	–	–	–	5,000 00
Sterling,	665 57*	478 13	1,002 12	212 60	–*	493 86
Stockbridge,	–	1,659 75	–	–	–	1,813 78
Stoneham,	349 50*	2,043 71	–[1]	–	–*	2,104 35
Stoughton,	–	1,459 62	–	–	–*	1,557 35
Stow,	903 91*	414 85	1,333 23	304 64	918 38*	424 82
Sturbridge,	–	440 62	–	–	–	407 65
Sudbury,	1,370 29*	531 46	2,012 08	592 20	880 62*	544 28
Sutton,	–	587 32	–	–	–	618 05
Swampscott,	–	4,728 81	–	–	–	4,955 16
Swansea,	–	666 79	–	–	–	662 11
Taunton,	–	5,000 00	–	–	–	5,000 00
Templeton,	–	673 26	–	–	–	729 96
Tewksbury,	1,266 25*	583 27	1,778 03	570 75	594 76*	605 54
Topsfield,	1,045 21*	857 61	852 13	559 61 1,006 17	–[2]*	1,243 95
Townsend,	365 61*	528 84	1,516 04	322 52	387 20*	538 96
Truro,	–	157 21	–	–	–	157 91
Tyngsborough,	1,480 47*	254 54	1,078 52	1,111 74	823 98*	262 14
Upton,	–	456 76	–	–	–	474 22
Uxbridge,	–	1,473 26	–	–	–	1,413 00
Wakefield,	–*	4,010 72	2,894 61	2,264 76	–*	4,372 26
Walpole,	–	2,391 00	2,370 85	693 80	–*	2,573 82
Waltham,	1,346 21*	5,000 00	8,666 81	5,531 20	238 80*	5,000 00
Wareham,	–	2,087 48	–	–	–	2,212 11
Warren,	–	800 29	–	–	–	840 79
Warwick,	–	179 81	–	–	–	165 89
Watertown,	–	5,000 00	–	–	–	5,000 00
Wayland,	1,044 94*	1,152 62	2,463 55	963 97	710 93*	1,270 83
Webster,	–	3,487 02	–	–	–	3,482 36
Wellesley,	–	5,000 00	5,740 22	2,910 54	370 11	5,000 00
Wellfleet,	–	410 67	–	–	–	407 46
Wenham,	1,577 97*	999 67	1,987 61	726 86	987 04*	1,051 16
West Boylston,	–	353 82	–	–	–	378 60
West Bridgewater,	434 48*	561 81	927 37	444 46	–*	613 84
West Newbury,	1,128 34*	425 49	1,444 83	402 23	1,019 34*	423 04

[1] Complete returns not filed yet.

[2] Work financed by State Forester's office.

Cities and Towns.	1911. Reimbursement.	1912. Required Expenditure.	1912. Total Net Expenditure.	1912. Private Work.	1912. Reimbursement.	1913. Required Expenditure.
Westborough,	–	$1,311 05	$1,216 66	$408 20	–*	$1,293 07
Westford,	$1,555 98*	829 36	2,259 31	371 87	$1,429 95*	859 24
Westminster,	154 49	352 48	482 95	228 95	130 47*	377 73
Weston,	1,354 28*	3,112 89	4,536 95	4,446 02	615 46*	3,359 89
Westwood,	–	1,409 36	1,068 98	294 13	–*	1,641 04
Weymouth,	–	3,461 62	3,472 86	1,519 50	8 99	3,982 86
Whitman,	–	2,172 46	–	–	–	2,215 37
Wilmington,	2,232 16*	642 15	2,694 31	701 07	2,052 16*	683 73
Winchendon,	–	1,659 88	1,154 35[1]	153 70	–	1,683 77
Winchester,	–	5,000 00	2,313 30	2,560 00	–*	5,000 00
Winthrop,	–	5,000 00	–	–	–	5,000 00
Woburn,	3,509 87*	4,624 55	8,729 52	1,290 66	3,025 92*	4,660 11
Worcester,	–*	5,000 00	–	–	–	5,000 00
Wrentham,	–	541 37	–	–	–	560 48
Yarmouth,	–	942 63	–	–	–	989 19

[1] No papers filed.

Legislation.

Except strengthening and perfecting several of the existing laws by amendments, the last Legislature enacted only one piece of important legislation relating to forestry.

The widespread interest on the part of Massachusetts citizens in the work of reforestation, and the desire of many to utilize their waste lands in the most profitable way, has been followed by a general demand for knowledge regarding the matter of obtaining seedlings, the cost of the same, and, in many cases, complaints on account of inability to purchase them at reasonable prices. These facts prompted the State Forester to consider the advisability of establishing State nurseries on lands owned by the Commonwealth at State institutions, where the labor of the inmates could be used without expense, thus enabling the production of nursery stock at a price well within the means of anybody desiring to purchase it. A bill providing for the creation of such nurseries, under certain conditions, was passed and approved. The act reads as follows: —

AN ACT RELATIVE TO THE ESTABLISHMENT OF FOREST TREE NURSERIES UPON LAND OF THE COMMONWEALTH.

Be it enacted, etc., as follows:

SECTION 1. Chapter four hundred and nine of the acts of the year nineteen hundred and four is hereby amended by striking out section three and inserting in place thereof the following: — *Section 3.* The state forester may establish and maintain nurseries for the propagation of forest tree seedlings upon such lands of the commonwealth, at the Massachusetts Agricultural College at Amherst, or at any other state institution, as the superintendent or trustees of the institution may set apart for this purpose. Superintendents of institutions where land is set apart for this purpose may furnish free of cost the labor of their inmates necessary to establish and maintain the said nurseries. Seedlings from these nurseries shall be furnished to the commonwealth without expense for use upon reservations set aside for the propagation of forest growths for other than park purposes. All stock grown in nurseries established under the provisions of this act shall be used within the limits of the commonwealth and shall be furnished to state institutions free of charge. The state forester may distribute seeds and seedlings to land owners, citizens of the commonwealth, under such conditions and restrictions as he may determine, subject to the approval of the governor and council.

SECTION 2. This act shall take effect upon its passage. [*Approved May 11, 1912.*

SUMMARY OF RECOMMENDATIONS OF THE STATE FORESTER.

1. That the general plan suggested and carried out last year regarding the moth work be continued this year, namely, that the appropriation be reduced $50,000 from last year, making the sum $200,000 for 1913.

2. That towns having a valuation of $2,000,000 or less be reimbursed by the State for one-half the expense in fighting forest fires.

3. That an increased appropriation be made to carry on the work of reforestation.

4. That the present forest fire permit law be amended so as to make it apply to all the cities and towns of the Commonwealth.

5. That the office of tree warden in towns be made an appointive office by the selectmen, instead of elective, as at present.

6. That legislation be enacted regulating the disposal of slash or brush, following wood and lumbering operations.

7. That the time of appointment of forest wardens and local moth superintendents be changed from "March or April" to January, in order to give sufficient time to organize for spring work.

8. The passage of a law requiring portable sawmills to be equipped with suitable devices to prevent the escape of sparks or cinders.

Respectfully submitted,

F. W. RANE,
State Forester.